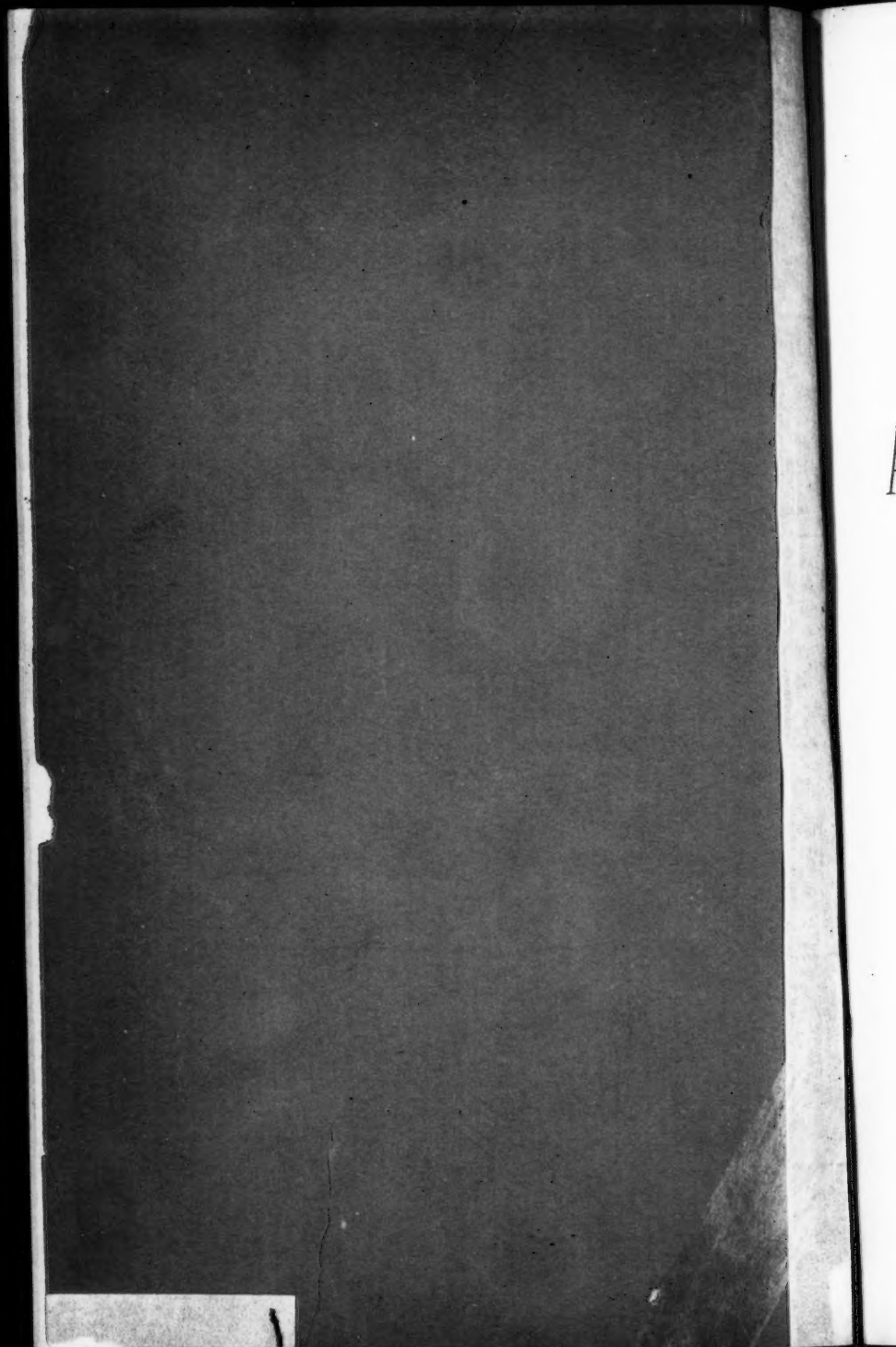


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Transactions
American
Fisheries Society
...
1896



TRANSACTIONS

OF THE

American Fisheries Society

TWENTY-FIFTH ANNUAL MEETING.

Held at Battery Park Aquarium, New York City,

Wednesday and Thursday, May 20th and 21st, 1896.

GLENS FALLS PRINTING CO.,
GLENS FALLS, N. Y.
1897.

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OFFICERS FOR 1896-'97.

PRESIDENT, HERSCHEL WHITAKER.....*Detroit, Mich.*

VICE-PRES., DR. BUSHROD W. JAMES.....*Philadelphia, Penn.*

TREASURER, L. D. HUNTINGTON.....*New Rochelle, N. Y.*

REC. SEC'Y, A. NELSON CHENEY.....*Glens Falls, N. Y.*

COR. SEC'Y, H. B. MANSFIELD, U. S. N.....*{ Navy Yard,
{ Brooklyn.*

EXECUTIVE COMMITTEE.

H. C. FORD.....*Pennsylvania*

W. L. MAY.....*Nebraska*

J. W. TITCOMB.....*Vermont*

DR. T. H. BEAN.....*New York*

F. B. DICKERSON.....*Michigan*

J. E. GUNCKEL.....*Ohio*

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MINUTES
OF THE
TWENTY-FIFTH ANNUAL MEETING
OF THE
AMERICAN FISHERIES SOCIETY,
HELD IN
BATTERY PARK AQUARIUM,
Castle Garden, N. Y.,
ON WEDNESDAY, MAY 20TH, 1896.

The following members were present on roll call:

J. E. Gunckel,	Toledo, Ohio.
Frank J. Amsden,	Rochester, N. Y.
Bernard L. Douredoure,	Philadelphia, Pa.
T. E. Crossman,	Brooklyn, N. Y.
Jas. A. Dale,	York, Pa.
Edward Thompson,	Northport, N. Y.
Louis Struber,	Erie, Pa.
G. E. Jennings,	New York City.
F. B. Dickerson,	Detroit, Mich.
Herschel Whitaker,	Detroit, Mich.
H. B. Mansfield,	U. S. Navy.
A. N. Cheney,	Glens Falls, N. Y.
Chas. H. Babcock,	Rochester, N. Y.
Barnet H. Davis,	Palmyra, N. Y.
Fred Mather,	Brooklyn, N. Y.

Jno. W. Titcomb,	St. Johnsbury, Vt.
Edward P. Doyle,	New York City.
Tarleton H. Bean,	New York City.
L. D. Huntington,	New Rochelle, N. Y.
D. G. Hackney,	Fort Plain, N. Y.
James Annin, Jr.,	Caledonia, N. Y.
Dr. Bushrod W. James,	Philadelphia, Pa.
H. P. Frothingham,	Mount Arlington, N. J.
Hendrick S. Holden,	Syracuse, N. Y.
L. D. Alexander,	New York City.

PRESIDENT'S ADDRESS.

GENTLEMEN :

I take this the first opportunity offered to thank you for the honor conferred at our last meeting in selecting me as your President, it having (with few exceptions) been the custom of previous Presidents to submit an address at the Annual Meeting of the Society upon some kindred subject. I feel reluctant to continue the custom, for the reason that it would consume much valuable time of our brief business session of a single day, which scarcely affords time to transact the necessary yearly business of the Society, the reading of the able and interesting papers prepared by many of the members, and a full discussion of the same. Therefore, I shall confine myself briefly to a strictly business matter, although one in my judgment that is of vital importance to all organizations, that is, "Membership and finance."

Gentlemen, when I carefully looked into this important matter as President of this organization I found by the Treasurer's report a balance of \$64.06 in the treasury, and of which amount the Treasurer informed me \$30 was from dues of 1895. There were still bills for the year 1894 amounting to \$156.70 unpaid, making a deficiency of \$92.64, which without

the \$30 dues of 1895 left an actual deficit of \$122.64 for year 1894, and this with a published membership list of about 260 members. The Secretary and myself prepared and sent out three different circulars to various members and otherwise made every effort to collect all dues, as well as to correct the list of members. The result has been that the deficiency of 1894, as well as all expenses of the Society for 1895, have been paid, and there should now be a balance of \$120 and over in the treasury. In connection with this matter I have carefully prepared a detailed statement, which I submit for the information of members present.

L. D. HUNTINGTON.

Mr. H. Whitaker: In order that we may have an orderly proceeding, I would suggest that there are probably gentlemen who desire to join the Society. I have the names of a couple. I think they ought to participate in the proceedings regularly; and I therefore suggest that the names of new members be now presented and referred to the Executive Committee to report at this session. I propose the names of Mr. Freeman B. Dickerson, one of the members of the Michigan Fish Commission, and Mr. Bryant Walker, of Detroit.

The President: Any gentlemen having new members to propose, they will please offer them now, as it is customary for the Secretary to cast the ballot and make one job of it; and if the gentlemen are here they can take part in the proceedings.

Mr. Dale: I solicited the Fish Commissioners of California to become members of the Society, and I have received a letter from them enclosing six dollars for the membership of two of the gentlemen, Messrs. H. T. Emerick and William C. Murdoch, of California.

Mr. Huntington proposed the name of Charles H. Walters, of Cold Spring Harbor, N. Y.

Mr. Babcock proposed the name of Hendrick S. Holden, of Syracuse, one of the Commissioners of Fisheries, Game, and Forests, of New York State.

The President: The Secretary requests me to ask the gentlemen in proposing names of new members to kindly submit them in writing with the address, that he may have the names with the addresses perfectly correct. He says it is impossible for him to hear them with the assurance of getting them correctly, and that is one of the great difficulties we found in trying to correct our list, that names have been misspelled and the residences are very often wrong.

The President: It has been suggested by Mr. Whitaker that he is the only member of the Executive Committee present, to whom these names would be referred to act upon, and that I should appoint other members temporarily. Therefore, in the absence of the other members of the Executive Committee, and for that purpose, I will name Mr. Cheney and Mr. Gunckel.

The Committee then retired.

The President: The Executive Committee, to whom were submitted the names of the candidates for membership, are prepared to make a report. We will hear the report of the Executive Committee on the names submitted to them.

REPORT OF COMMITTEE.

THE AMERICAN FISHERIES SOCIETY.

Gentlemen: The Executive Committee, to whom was referred the matter of applications for membership, beg leave to report that they recommend the election of the following persons to membership in the American Fisheries Society:

Hendrick S. Holden,	Syracuse, N. Y.
Charles H. Walters,	Cold Spring Harbor, N. Y.

H. T. Emerick,	San Francisco, Cal.*
William C. Murdoch,	San Francisco, Cal.
Freeman B. Dickerson,	Detroit, Mich.
Bryant Walker,	Detroit, Mich.

Respectfully submitted,

HERSCHEL WHITAKER,
A. N. CHENEY,
J. E. GUNCKEL,

Committee.

Mr. Whitaker: I move that the report of the Committee be accepted and these gentlemen declared elected.

The President put the question, which was carried.

The President: Mr. Secretary, have you any report to make?

The Secretary then submitted the following report:

NEW YORK CITY, U. S. A.,

BATTERY PARK AQUARIUM, May 20, 1896.

AMERICAN FISHERIES SOCIETY.

Gentlemen: I have the honor to present a brief account of my duties as Recording Secretary of the Fisheries Society.

A resolution of the Committee on Nominations last year, adopted June 12, recommended a change in the style and character of the transactions and that the volume be published within sixty days after the meeting. Your Recording Secretary earnestly tried to carry out this praiseworthy resolution, but a delay of two months was caused by the fact that some of the articles had been given out for newspaper publication and could not be recovered sooner. Another greater delay occurred through the failure of many members to reply to letters and circulars asking for information about names and addresses to revise our membership list, which was known to be full of errors.

There was also a great deal of difficulty in revising the report of the discussions of papers—a difficulty which, I regret to say, was not satisfactorily removed. Finally, in November, the copy of transactions for 1895 went to the printer, who thought so much of it that he held it in suspense until the end of January, 1896. Some copies were mailed on the day of their receipt, January 31, and on February 4 the last of them were sent out.

Three circulars asking for payment of dues and data for correction of membership list were mailed in July, November, and February. The first notice of the meeting was issued March 15 and the final notice on April 25.

It is earnestly suggested that the Secretary alone cannot transact the business of the Society; he must have the full co-operation of all the members in order to perform his work efficiently and promptly. The membership list must be still further corrected, and it is due to the Secretary, who edits the transactions, to let him have all papers first and let the newspapers wait until copies can be furnished.

Very respectfully,
TARLETON H. BEAN.

The President: You have heard the report of the Secretary and if there is no objection it will be placed on file.

The President: The Treasurer's report is next in order.

The Treasurer presented the following report:

TREASURER'S REPORT.

FRANK J. AMSDEN,
IN ACCOUNT WITH
AMERICAN FISHERIES SOCIETY.

DR.

To balance on hand.....\$ 64.06
Membership dues received to date... 477.00

CR.

\$541.06

Thos. Humphrey.....	\$ 6.51
Express40
Stenography	20.00
Express55
Thos. Humphrey, balance on bill of	
1894	156.70
Lehman Bros.....	6.50
Thos. Humphrey.....	2.50
Type-writing.....	1.75
Thos. Humphrey.....	6.00
Letter Book.....	3.75
T. H. Bean.....	19.59
Thos. Humphrey.....	162.00
" "	2.00
Mr. Huntington, postage...	3.00
Thos. Humphrey.....	3.00
Postage	5.00
Express50
Cash on hand.....	141.32

NEW YORK, May 20, 1896.

\$541.06

Approved,

CHAS. H. BABCOCK,
BERNARD L. DOUREDOURE,
G. E. JENNINGS,
Auditing Committee.

The President: No objection being made, the report of the Treasurer will be accepted and placed on file.

The President: It has been customary, early in the session, to appoint a committee of three on auditing, committee of five on nominations, and a committee of three on next place of meeting. I find that to be customary, and if some gentleman will make a motion to that effect, I will announce the committees and they can report soon after we reconvene this afternoon.

Mr. Whitaker: I move that the President be authorized to appoint the necessary committees.
Carried.

The President: There is one thing that has caused a great deal of trouble. There have been a number of members claimed that they resigned at a certain time. There are nine members who have paid their dues—there were ten—and with their dues have requested that their resignations be accepted. Following are the names of these nine members: Jno. T. Agnew, J. Penrose Collins, J. Brown Goode, Chas. F. Imbrie, J. D. Quackenbos, H. M. Rogers, Benjamin Wood, N. Wallace, A. Haley. These gentlemen have paid their dues up, and asked that their resignations be accepted. I think it is proper and right. We have no records of any resignations on our book; and this has been a great cause of difficulty in correcting this list. That is one reason why it is not correct. These gentlemen have paid their dues and ask that the Society accept their resignations.

Mr. Cheney: I move that the resignations of the nine members whose names have been read be accepted.
Carried.

The President: I believe the routine business is completed.

The Secretary: Will you appoint the committees?

The President: I will appoint them in a few minutes.

Mr. Whitaker: Before the regular order of business of reading papers is begun, and in line with the suggestion contained in the report of the Secretary, I would like to offer the following resolution: *Resolved*, That all papers read before the Society be handed to the Secretary and retained by him for publication. I think it may overcome the difficulty referred to.

Mr. Cheney: Do you mean to say that the newspapers are not to have access to them?

Mr. Whitaker: We cannot go beyond our own business here. There is no reason why the writer of a paper, if he wishes to do so, should not furnish anybody he cares to with a copy of the paper. The original paper should be retained, so that we will have no further trouble of this kind, and no delay in the publication of our report by reason of it.

Mr. Whitaker's resolution was put and carried.

The President: We will now proceed to read the papers, and perhaps it would be well for the Secretary to read the titles of the papers that are to be read.

The Secretary: The list of papers, arranged in the order of the receipt of letters announcing them, is as follows:

- J. E. Gunckel, Toledo, O. *Hon. Emery Davis Potter.*
 Fred Mather, Brooklyn, N. Y. *Natural Food for Trout Fry.*
 Dr. Tarleton H. Bean, Battery Park Aquarium, New York. *Pond Culture of California Salmon in France.*
 A. Nelson Cheney, Glens Falls, N. Y. *Concerning the Work of the Fisheries, Game, and Forest Commission of the State of New York.*

- H. P. Frothingham, Sec. and Treas. N. J. Fish and Game Commission, Mt. Arlington, N. J. *Report on the Protection of Fish and Game in the State of New Jersey.*
- Dr. Bushrod W. James, N. E. cor. 18th and Green Sts., Phila., Pa. *Inter-State Protection of Food Fish.*
- Seymour Brown, Detroit, Mich. *The Propagation of Small-mouthed Black Bass.*
- L. D. Huntington, New Rochelle, N. Y. *Waste of Food Fish.*

The Secretary: I think Mr. Gunckel is the first on the list of those mentioned who is present.

Mr. H. Whitaker: Last year, or two years ago, to favor gentlemen who had prepared papers and had taken the pains to be present, we gave such papers the preference in the reading, and we ought to follow that practice each year. If the writer of a paper is present in person such papers should be first read. Let them be followed by the papers submitted by those who are absent; and I move that that order be adopted this year. *Carried.*

The President: We will now listen to the paper by Mr. Gunckel on the Hon. Emory Davis Potter. At the conclusion of the reading of the paper Mr. Gunckel distributed photographs of Judge Potter to the members.

The President: Dr. Bean has a paper on the "Cultivation of the California Salmon in France."

Dr. Bean: I am very much afraid that this paper is too long to be read just now. At the same time, it is a paper which bears upon the subject which we have been discussing, looked at from the French standpoint. It has to do with the rearing of the California Salmon in France, in ponds; and I would like to read it to the Society.

The President suggested that it be postponed until the afternoon session, which was agreed to.

The President: The Secretary will now announce the committees that have been appointed.

The Secretary read the committees as follows:

Committee to audit the Accounts and Treasurer's report:

Messrs. Babcock, Douredoure, and Jennings.

Committee on Nominations:

Messrs. Whitaker, Mansfield, Dale, Gunckel, and Mather.

Committee on Locality and Time of the Next Meeting:

Messrs. Davis, Struber, and Dickerson.

Committee on the resolution of Mr. Mather to draft a suitable statement upon the death of Judge Potter:

Messrs. Mather, Gunckel, and Whitaker.

Mr. Herschel Whitaker: If you will put somebody else on the Memorial Committee it will gratify me; I shall be engaged.

Mr. Mather: I would like very much if you will put some one else on the Nominating Committee in my place. It is not at all sure that I will be here tomorrow.

Mr. Whitaker: The Committee will report today.

Mr. Mather: I would rather not serve.

Mr. Titcomb was substituted in place of Mr. Mather on the Nominating Committee.

Mr. Amsden was substituted in place of Mr. Whitaker on the Memorial Committee relative to the death of Judge Potter.

Mr. Gunckel: Can these committees meet today?

The President: The ordinary committees are supposed to meet and report very soon after we reconvene.

Mr. Whitaker: I move that we adjourn until two o'clock.

The President: A motion has been made to take a recess until two o'clock. Gentlemen, before we adjourn, I would like to have you hear from the gentleman who is the Chairman of the Committee on Entertainment tomorrow; and it is quite likely that he will outline what you may expect from the committee.

Mr. Davis: Gentlemen, in behalf of the Fish Commissioners of the State of New York, I desire to state that the committee will give an excursion tomorrow to the Cold Spring Hatchery, leaving Pier A, just adjoining the Battery, at nine o'clock. We would like to have you all present with your friends.

The President: There is one further matter my attention has been called to. There is a register here, which it is desirable to have each and every member sign, so that we may get his name and address correctly.

The meeting then adjourned until 2 o'clock.

WEDNESDAY AFTERNOON SESSION.

The President called the meeting to order at 2:10 o'clock.

Mr. E. Whitaker: Mr. President and gentlemen: Having had a somewhat extended experience in attempts to pass and defeat game laws, and having studied a great deal as to the solution of the difficulty, in order to overcome and obviate the necessity for the everlasting changes being made, so that a man may know from month to month and year to year what the game laws are—I say, after considering that, I have come to the conclusion that there is just one way in which the game laws can be put into such shape that there will be at least some certainty and some reasonableness in them; and that is, that the constitutions or statutes of the several states should contain a provis-

ion creating a game and fish commission, that should be constitutional officers, and they should be vested with the power to pass upon all game laws, so that their veto should kill any act that the Legislature might pass, in case the commission should deem it an impracticable act. I believe that is the only way in which we will ever get a uniform and certain and a constant game law throughout the states. It is better, even, to have a bad law, and have it well understood and certain, than to have a good law that is constantly shifting and changing.

With that end in view, I offer this resolution, in order to get the sense of this Association upon the subject, because this Association, representing, as it does, the different states, is the only Association whose opinions will go throughout the different states, and whose opinions will have force. It was with that intention that I drew this resolution:

Resolved, That it is the sense of this Society that each state should provide in its Constitution for a Fish and Game Commission, and should also provide that no law should be passed permitting, prohibiting, or regulating the catching of fish or game without the approval of such Fish and Game Commission.

The President: Gentlemen, you have heard the resolution offered by Mr. E. Whitaker. Is it seconded?

Mr. Thompson: I second the resolution.

Dr. B. W. James: I ask the gentleman whether he intends in this resolution that he offers that the Commission shall include both the fish and game laws?

Mr. Whitaker: I think so; yes, sir.

Dr. James: We have in our State Legislature in Pennsylvania a committee called the Fish and Game

Committee, and all these matters are referred to that Committee, which is jointly interested in these two matters. They came on one occasion into conflict over some game laws and fish laws, which did not work harmoniously, and it was found that probably the fish interest had better be alone, and the game laws alone, in the charge of separate committees. I am fully in favor of protecting some way both the game as well as the fish of this country. The matter has been up before us in our Society in Philadelphia, with the aim of getting together the different fish organizations of the state, in order that we might conciliate those in the western part of the state, the commission there being rather inimical to some of the laws we want passed for the larger rivers, like the Delaware and Susquehanna.

In the upper streams they want to clean the streams out in certain parts, which, in our state, have certain of these hatcheries supported by the state funds, and our Society wants to nourish and keep them together and add to them. There is an element in the state which desires to wipe out the commission altogether and to do away with these fish hatcheries. In the session before the last—our Legislature meets every two years—I found that spirit emphasized there, and I did not know but that before the Legislature adjourned we would have the fish commissioners abolished, not this year, but in the future. The idea was to cut down the appropriations and make them so small that they could not support the hatcheries. Then the plan was to cut down the salaries of the commissioners, and make it so useless that a man would not pay attention to the interest, and in that way the effort was made, but it did not succeed.

The question is whether this resolution covering both fish and game in the one commission would be advisable or not. I am in favor of it fully, and if it

can be worked together, I would like to have the resolution passed as it is here. I have given my experience in my own state in regard to having the two commissions together.

Mr. Amsden: I am glad to have this matter brought up in the shape in which it is presented, and I think it would be advantageous for the Society to take a stand on the resolution. I have had some experience in New York State in the matter of legislation—getting good laws passed and bad ones defeated. Going back now to the time when Mr. Whitaker, Gen. Sherman, and Mr. Blackford, I think it was, were made a codifying committee on the game laws, and they presented a report which was approved. It went to the Legislature and was so mangled there that it could hardly be recognized; but, after all, the subsequent legislation that has been carried on at Albany has been brought gradually down to their original proposition or report.

The great trouble we experience at Albany is this, that in the two houses are men who have no knowledge on the question at all, and are apt to be led and influenced by their constituents more in favor of liberty than protection.

This resolution is quite a step in the right direction. I do not expect to see it accomplished immediately, but I would like to see the beginning made in this way in this Society, which is really the head and leader of all our work, and perhaps in time we may bring it about.

The laws enacted this winter in our Legislature fortunately have been guided and influenced very much by our commission, which had the matter of protection well established in their own minds, and when the matter was referred to them they acted in that direction with better results. It is unfortunate that the Legislature should perform their duties in this line in the way they do. There is one thing I do realize, and

have all the while, and that is the lack of stability in our laws. The people themselves are ignorant all the time as to what the law is. Every year we have to re-inform them as to what the laws are; changing and shifting the laws each year makes confusion. If we could only have laws fixed and have them constant for a number of years, it would be a very great advantage. I am very much in favor of the resolution, and should have offered it myself if it had not been offered by Mr. Whitaker.

Mr. E. Whitaker: I would suggest that it would be well for the President to appoint a committee from each of the states, as far as he can, to carry the resolution into effect; and I ask to be excused from serving on that committee.

The President: The question is for the chair to appoint a committee of one from each state?

Mr. E. Whitaker: One or more.

The President: The chair will, when he has leisure, make that selection.

Mr. H. Whitaker: I hope the chair will not excuse Mr. E. Whitaker from serving on the committee. He is the most familiar with the subject; he is responsible for this thing, and he cannot dodge the responsibility.

Mr. Thompson: This matter is in the hands of the chair.

The President: The chair does not propose to be tampered with by the profession or any of the Whitaker family. (Laughter.)

The President: We will now receive the report of the Nominating Committee.

REPORT OF THE NOMINATING COMMITTEE.

AMERICAN FISHERIES SOCIETY.

Gentlemen: The Nominating Committee make the following report:

For President, Herschel Whitaker.

Vice-President, Bushrod W. James.

Recording Secretary, A. N. Cheney.

Corresponding Secretary, H. B. Mansfield.

Treasurer, L. D. Huntington.

Executive Committee—

H. C. Ford,

Freeman B. Dickerson,

W. L. May,

J. W. Titcomb,

J. E. Gunckel,

Tarleton H. Bean.

Respectfully submitted,

H. WHITAKER,

H. B. MANSFIELD,

J. A. DALE,

J. E. GUNCKEL,

J. W. TITCOMB,

Nominating Committee.

Mr. E. Whitaker moved that the report be adopted.

The President: If I understand it, the adoption of the report has always carried the election; that has been the rule.

The President: The Auditing Committee will now report.

REPORT OF THE AUDITING COMMITTEE.

AMERICAN FISHERIES SOCIETY.

Gentlemen: The committee appointed by the chair to examine the accounts of the Treasurer respectfully report that they have examined the books and

vouchers of the Treasurer and find the same to be correct.

Respectfully submitted,

CHARLES H. BABCOCK,
B. L. DOUREDOURE,
G. E. JENNINGS,

Committee.

The President: If there is no objection the report of the committee will be considered as adopted.

Mr. Davis reported for the committee to select the next place for holding the annual meeting, that they had selected Detroit, Michigan.

Mr. Davis: Under the resolution the committee was not empowered to designate the time, only the place; but we recommend June 17 and 18, 1897.

The President: No objection being made, the report of the committee will be considered as adopted.

Mr. Mather: Mr. President, the committee appointed to draft the resolutions concerning Judge Potter concluded that the time was not sufficient in which to do it, and we ask for further time.

Mr. H. Whitaker moved that the committee be granted further time in which to report. *Carried.*

The President: The next paper in order under the resolution passed would be that of Dr. Tarleton H. Bean. Since we adjourned we have with us Dr. Bushrod W. James, who has a paper to read, "The Interstate Protection of Food Fish." As Dr. Bean's paper is somewhat in connection with the previous paper that was read, if there be no objection, I think it would be advisable to have Dr. Bean's paper read and then take up the paper of Dr. James afterwards. We will now have Dr. Bean's paper on "The Culture of California Salmon in France."

Dr. Bean: I must apologize for the length of this paper, but where it is possible I will omit such portions as may be practicable. It has been partly dictated to a stenographer and partly written in longhand, and I have had no time to revise it. I think you will overlook the length of the paper, and allow me to do the best I can to give you the essential points without taking up too much time. It is an interesting paper, and especially so to us, because it refers incidentally to the pond method of rearing trout by means of natural food, that is, food which is supplied in the pond itself; and it is interesting for another reason, which is, that a Frenchman of high repute, a man in the first rank of fish culture in Paris, has succeeded in raising profitably as a commercial venture the California Salmon in ponds in France; secondly, he has secured the reproduction of that species without its ever having gone to salt water, and he says that after five generations in fresh water, the spawning is as ample as it was at the beginning. He says, furthermore, that the mortality among the females after spawning is much less than we know it to be in the natural condition of affairs in the Western rivers. It seems to me these things are matters of much importance to us, and on that account I hope you will bear with me if I do speak at some length.

Dr. Jousset de Bellesme is a man of the highest rank as a fish culturist, the director of the Aquarium of the Trocadéro in Paris, where, in a small space, a good many problems in the rearing of the *salmonidæ*, especially introduced *salmonidæ*, have been successfully carried out. I want to say further that my impressions of the results obtained by Dr. Jousset de Bellesme are drawn from personal observation, for I had the pleasure of seeing what he accomplished in the Trocadéro Aquarium, and I am sure that nowhere else in the world is the California Salmon reared as suc-

cessfully, grown as quickly, and in a general way brought into such condition as in that Aquarium.

Dr. Bean then reads paper.

Mr. Cheney then read a paper on "The Work of the Fisheries, Game, and Forest Commission of the State of New York."

The President: Gentlemen, if there is no discussion desired upon the paper, no remarks to be offered, we will proceed to the next paper, which is by Dr. B. W. James on "The Interstate Protection of Food Fish."

Dr. James: I think a very important point is the protection of the fish from an interstate point of view. We had some discussion on the subject some years ago, and I brought up the point that there had been cases where the Government has decided that it is unconstitutional to pass any United States law; and yet it seems that there ought to be some measure by which all the states could be reached. The practice of having the states make separate laws does not seem to work very well. I simply want to throw out some ideas to keep the matter up in the minds of the people interested; not that I want to give any information to those working in the direction of propagating fish, my idea being in the way of protecting the food fishes of the states and country at large. If my views do not coincide with those held by you, you are at liberty to discuss them as freely as you wish.

Dr. James then read his paper.

Dr. James: In the Delaware River some years ago the promiscuous fishing reduced the amount of shad, as I believe has been stated on this floor by Mr. Ford, to a valuation of about seventy-five thousand dollars. During the year before last I think it had reached a valuation of some four hundred thousand dollars, and last year, I have it from Mr. Ford, who is our commissioner, it amounted to over five hundred and twenty-five

thousand dollars, and this year the supply of shad on the Delaware has been unprecedented. We have had a larger number of fish running in the Delaware, and of course the fisheries have represented a larger income than last year. We have been propagating these fishes in the hatcheries. There has been one recently established at Bristol, on the Delaware, and the commissioners are busy at Gloucester collecting the eggs in all the large fisheries. They propagate these, and they are put in the upper streams, so that in that way we are aiming to increase the amount of fish in our larger streams and getting a larger return for our state. What Pennsylvania reaps in that way, of course New Jersey and New York is likely to get some of the benefit of.

The Secretary: Mr. Huntington has a paper, somewhat in line with the paper just read.

The President: I have a paper here on "Waste of Food Fish." While we have heard the grievances of the lake region, etc., I wish to state the grievances of we sea-board people.

Mr. Dickerson: I would offer this resolution:

Resolved, That a committee consisting of the President-elect and the Secretary be appointed a committee to prepare a uniform bill for the protection of fish in all the states bordering on the Great Lakes; that the bill be submitted to the various commissions for approval, and that the bill be submitted to the next Legislature in each state.

Mr. Amsden: I think we ought also to include the rivers that cover the shad fishing, and also this matter of menhaden. It is time that this Society showed itself to be something and acted on something, and I think we have a President who can take hold, with the assistance of such a committee as he may appoint at

his leisure, and accomplish something. The proposed bill should go on record, and with the communications presented will be argument enough, and ought to be presented in proper form as coming from the American Fisheries Society, so that after a while it will become known as an aggressive body.

Mr. Whitaker: I want to make a suggestion as to the resolution. I would ask Mr. Dickerson to re-form it. The bill should be drafted after conversation with these men representing the different states and an agreement from them. I suggest that Mr. Dickerson put his resolution in this form: "That it is the sense of this American Fisheries Society that some such action should be taken," and leave the matter of the drafting of a uniform bill to a subsequent meeting, that shall represent the interests of the different states.

Mr. Amsden: Will you have it, Mr. Whitaker, that it comes from this Society, so that the Society gets the credit of it?

Mr. Whitaker: The Society gets the credit for it, in adopting it as its sense.

The President: Do you accept the suggestion Mr. Dickerson?

Mr. Dickerson: Yes, sir.

Dr. James: With regard to this matter, it seems to me that it is time for action. All the debate on this subject here recently shows that there is a very great need for action upon this subject by the states, and if we leave it to the states indefinitely, the Government of the United States will take no action, and, of course, in that event we will not accomplish anything, and the sooner we get at the matter the better. The resolution as originally offered was most correctly framed, because the President and Secretary certainly have all these different laws at their command and know just what is needed, and if some sort of a draft is made and brought up at our next meeting and discussed, we will

have something to act upon. If it is left indefinitely in this way, simply recommendatory, it may fall as other things have fallen. I am in favor of prompt action; and not only that, I would like to see the same action taken in the direction of looking forward to the international supervision in the same way of the coast interests and our entrance to the rivers, if it is possible. If it cannot be done under the Constitution of the United States, then Canada and Mexico and the United States ought by some method to appoint a joint commission or joint committee, which could devise some way by which their interests can all be brought together, and they can recommend in some form a sort of international agreement for the protection of the waters in the neighborhood of their individual countries. It must come to that sooner or later; otherwise the ocean will be depopulated of many of its food fish and of the larger fish.

We do know that up in the Northwestern country, where other countries come in, bordering on the waters of the Behring Sea, in years to come you will find that great international questions will arise out of this late decision as to the method which has been adopted in two countries, bringing together their countries and deciding by this method which has been adopted in settling that question. It is not settled, as other nations must come in. There must be an international law other than this three-mile method. There must be some law by which the fish coming from one country to another, or one part of the ocean to the other, coming in as a source of product and resource to Canada and Mexico, must be met by some international provision. A simple protection three miles from the coast does not meet the question. We all see that, and sooner or later it must come to that; and before that we should, if possible, get all the states in this country, so far as we have authority to suggest, this

American Fisheries Society ought to induce the states to get together and make their laws governing the states and the borders of these states in which food fish are. Subsequently, in years to come, there must naturally be an international law which will protect larger areas. The whale and other large fishes in Northern countries are nearly all gone and will continue to fall away, and so will the salmon fisheries, we all know, sooner or later be abandoned, because of their unproductiveness, on account of the way they are being taken into the market; and we ought to look forward to some ultimate action in that way.

Mr. Thompson: I wish to offer this resolution:

Resolved, That the President appoint a committee of one member from each of the seaboard states, to whom the subject of Mr. Huntington's paper shall be referred, with power.

Dr. Bean: I would like to make a remark on the resolution which is before the Society, if I may be allowed to do so. The resolution of Mr. Dickerson provides that a committee be appointed to draft a form of bill to be approved by the various commissions for the protection of fish in the various states bordering on the Great Lakes, and that such bill be submitted to the next Legislature in each state.

Mr. Chairman, the remark I want to make is this: We have been members of the Fisheries Society for a great many years, and we have observed the course of business here, I think, very thoroughly. Now, it appears to me that the work of the Society for a good many years, after we got away from New York, Chicago, Detroit, or Washington, or wherever the meeting may be held, falls upon the President and Secretary. Mr. Whitaker knows it; Mr. Huntington knows it; Mr. Amsden knows it; we all know it. Is it going to

fall upon the President and Secretary again, or will the committees which may be appointed for special work do that work, conduct the correspondence, get the results, and make the reports?

A member (facetiously, perhaps): They have never been asked.

Dr. Bean: "They have never been asked?" There it is in the transactions, and how many men have acted on the instructions under which they were appointed last year? I do not say it in a fault-finding spirit, but it is true, and we all know it is true; and I hope it will not be so hereafter.

Mr. H. Whitaker: I would like to offer a substitute for both of these resolutions. I do not think the American Fisheries Society can do anything more than act as an advisory body. Any laws that may be drawn up, for general action by the lake states or seaboard states, must be agreed to by representatives of this Society. Your President or Secretary cannot do it. They can simply call a meeting, if it is your desire. I am aware of the very thing Dr. Bean refers to there, a resolution authorizing this thing to be done last year. If it is the sense of the Society that this thing should be done, the President will be glad to call together the members of the different commissions and of the fishermen of the lake states and seaboard states to meet in some convenient hotel, where these things can be done. The President and Secretary cannot draw up a form of a law and say you must agree to this. It would be arbitrary, and you can never make an agreement of that kind; but let the commission come together and discuss this thing; and if the Society re-affirms what it did last year, and says that it is the desire of the members that the President call a meeting next fall to discuss this question, it will be done.

No two men, Secretary, President, Treasurer, or

anybody else, entirely out of this Society, should draft a bill which is to govern the action of states in which they had no part whatever. It is impracticable, and that is all there is to it. I would move this as a substitute, if the gentlemen who introduced the other resolutions—Messrs. Dickerson and Thompson—will permit it:

Resolved, That it is the sense of the American Fisheries Society that laws regulating the commercial fisheries of the seaboard and of the Great Lakes should be drawn in the interest of the people and for the protection of the fisheries.

If this resolution is adopted, I think the President should be authorized to call a meeting of the representatives interested.

Dr. James: It is not that they shall draw a law to be enforced, but to draw up the features of a law which will embody all the points connected with this matter, and submit it to the commissions, and then get their approval, and next year we will have the basis by which some general law can be suggested by the Society.

Mr. Whitaker: If we are going to do anything, we have got to do it this fall, because many of our Western states have biennial sessions of the Legislature, and the first of January the matter must be presented. It would be a work of supererogation, and something we had no business to do, to make a law of that kind. Let us go to some of the gentlemen interested and then make that draft, and ask each state to bring it before the Legislature and get it passed.

I, therefore, renew my motion that the sense of the American Fisheries Society is that the commercial fisheries should be protected by proper laws; and that the President be authorized to call a meeting of the

representatives of the different states to consult on the matter of uniform legislation.

The President: Before the motion is put, I desire to say one word in connection with the resolution offered by Mr. Thompson. It appears, as regards the troubles on the Great Lakes, which run from 400 to 1400 miles distant from the seaboard, that you cannot very well provide for both of them at one time; neither do they both cover the exact ground, and are so far apart, and there is such a difference between the two points, both in distance and other things, that it would be well to separate them.

Mr. Whitaker: I think so, too.

The President: I would like to say this, gentlemen. I would like to see a committee appointed for the seaboard states, selected from members of this Society who are members of fish commissions, and let these people come together, and in justice to all interests see if they cannot get something which will be acceptable to the Legislatures of the respective seaboard states.

Mr. Amsden: There ought to be no delay.

The President: We will take the matter right up. Therefore, if you will relieve the resolution of Mr. Thompson from your motion, Mr. Whitaker—

Mr. H. Whitaker: I think it is better to withdraw the whole thing and then let the other resolutions be adopted.

The President: We will now consider the resolution of Mr. Thompson.

Dr. James: I have lost the thread of the business. I understood the resolution of Mr. Whitaker was first in order.

The President: That was withdrawn. The motion is now upon the adoption of the resolution of Mr. Thompson. It is as follows:

Resolved, That the President appoint a committee of one member from each of the seaboard states, to whom the subject of Mr. Huntington's paper shall be referred with power.

The question was put on the resolution, which was adopted.

Mr. Dickerson: I move that the President appoint a committee consisting of one member from each of the several Great Lake states, to whom the subject of protecting commercial fisheries shall be referred.

This resolution was carried.

The President: Mr. Whitaker has a paper.

Mr. Whitaker: I want to say to you that I have a paper here, which is of considerable interest, on the "Culture of Black Bass," but the hour is getting too late to read it. I understand there is to be a meeting tomorrow, and if it is to be held, and there is time for the consideration of this paper, I think we had better postpone the reading until tomorrow. May I ask what the arrangements are as to that matter?

The President: We will have a meeting on the boat if there is any business.

Mr. Whitaker: I suggest that the further reading of papers be deferred until tomorrow.

Dr. James: Perhaps while we are on this business we had better finish these papers.

Mr. Whitaker: Mr. Cheney said that he had an engagement and had to go away soon, and would like to have the reading deferred.

Dr. James: I think there would be more interest taken in the papers now than on the boat.

The President: There was a paper from Mr. Frothingham, who could not remain to read it, but who will be on the boat tomorrow. There are two papers.

Mr. Babcock moved that the thanks of the Society

be and they are hereby tendered to Mr. L. D. Huntington, Mr. Frank J. Amsden, and Dr. Tarleton H. Bean, the retiring President, Treasurer, and Secretary, for the efficient services tendered the Society in the past year, by putting it on a better financial basis and increasing the public interest therein.

Mr. Babcock called upon the new President, Mr. Whitaker, to put the motion to the house.

Mr. Whitaker: Courtesy will not permit the sitting President to present this motion; and therefore, at the suggestion of our friend from New York, I will put the motion to the house.

Unanimously carried.

The President put the question to the house whether to go on with the reading of the papers or to postpone them until tomorrow.

The President: It is understood that the reading of the papers is postponed until tomorrow.

Mr. Dickerson: I move that the Secretary be requested to insert the picture of Judge Potter in the transactions of this meeting, with the memorial.

Carried.

Mr. Mather announced that his article on scallops, which was announced to appear in the July number of the Popular Science Monthly, would be deferred until the August number.

On motion, adjourned to meet on the steamer *Valley Girl* at nine o'clock on Thursday morning.

SECOND DAY, THURSDAY, MAY 21ST, 1896.

Meeting called to order by President Huntington on steamer *Valley Girl*.

In the absence of Dr. Bean, the Recording Secretary, A. N. Cheney, Recording Secretary-elect, acted as Secretary.

The paper written by Mr. Seymour Bower, Supt. Michigan Fish Commission, upon "The Propagation of the Small-mouthed Black Bass," was read by Commissioner Whitaker. Owing to the absence of the stenographer, who missed the boat, the discussion which followed this paper was not reported.

By Mr. Whitaker:

Resolved, That the thanks of the American Fisheries Society be and are hereby tendered to the Fisheries, Game, and Forest Commission of New York for the entertainment tendered to this Society, and also to its efficient committee, Messrs. Davis, Holden, and Thompson.

Carried.

By Mr. Davis:

Resolved, That the thanks of the American Fisheries Society be and are hereby tendered to Mr. Starin for his almost annual courtesy of the use of a steamer for the entertainment of the Society.

Carried.

By Mr. Cheney:

Resolved, That the thanks of the American Fisheries Society are due to the Board of Parks of New York City, for the use of the lecture room of the Aquarium at Battery Park, and that they be tendered through the President of the Board, Hon. S. V. R. Cruger.

Carried.

The paper of Commissioner Frothingham, upon "Fish and Game Protection in New Jersey," was, in his absence, read by Secretary Cheney.

The names of Hon. F. D. Kilburn and Hon. John L. Hill were proposed for membership in the Society by Commissioner Thompson. Referred to Executive Committee and elected.

By Mr. Titcomb :

Resolved, That the meeting in Detroit in 1897 shall continue for three days, viz., June 17th, 18th, and 19th.

Seconded by Mr. Whitaker and carried.

The Committee upon resolutions on the death of Judge Potter reported :

The passing of Judge Emory D. Potter, a long-time and useful member of this Society calls for more than casual notice. Judge Potter's active identification with public affairs marked him as an important figure in national legislation during his political activities, and his important services in that connection will be deeply appreciated and have been duly noticed, and need not be here further referred to.

But his deep interest in fish culture and his influence in the shaping of public opinion demanding the protection of the public's interest in the commercial fisheries, is a matter of which this Society hereby desires to make due acknowledgment. The active years of his life were spent in advocating these principles, and the influence he exerted along these lines will be long remembered by reason of the passage of good laws and the creation of a deep public interest in these questions. It is therefore

Resolved, That this Society shall order spread upon its minutes an expression of regret for his death ; and

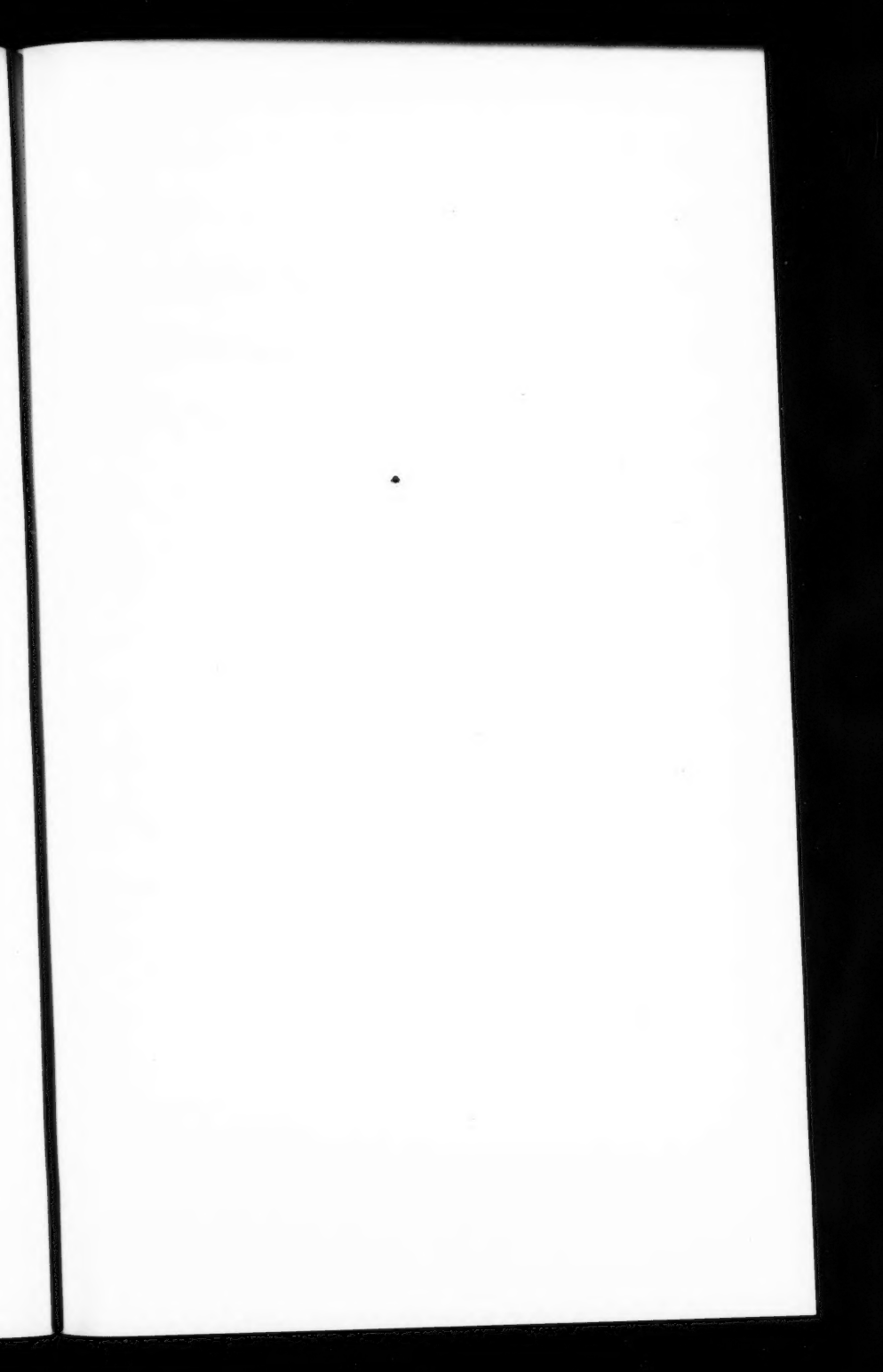
that we recognize therein that fish culture has lost one of its pioneers and most earnest advocates.

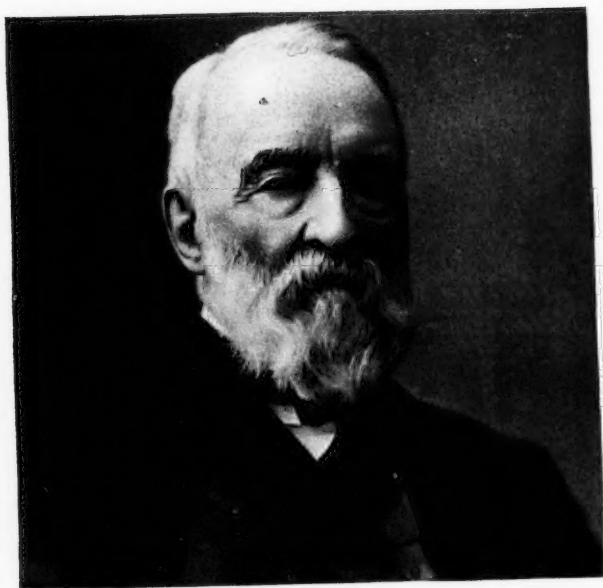
That the sympathy of this Society be extended to his family in their bereavement, and that we mourn with them, not only the death of a good friend, but the loss to his state and community of an upright man and a good citizen.

J. E. GUNCKEL.

Upon motion adjourned.

A. N. CHENEY,
Acting Secretary.





EMERY DAVIS POTTER.

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HON. EMERY DAVIS POTTER.

BY J. E. GUNCKEL, FISH COMMISSIONER OF OHIO.

A biographical sketch is probably the least interesting of any subject that could possibly be presented to a society the aim and object of which is the consideration of the propagation and protection of fish, but if you will bear with me for a very few minutes I will present to your attention a subject that will excite your interest and command your appreciation. By request I am to speak to you of a man whose name has been familiarly known throughout the United States, and intimately known to many of us for nearly half a century. As a member of this Society, and as Fish Commissioner of Ohio for many years, no person took a greater personal interest in the propagation and distribution of fish. From the first experiments in 1853 of artificial breeding of trout, when he was intimately associated with the late Dr. Theodatus Garlick, to the time of his death in 1896, he was a faithful advocate of the objects of this Society. I would like to invite your attention to a brief memorial touching the life history of our esteemed companion, showing his relationship to the interests of this Association and what we learn from the lessons so patiently taught us for nearly a century.

Some of the most distinguished men of the country have paid the highest tribute to his memory. Men of

national reputation have paid homage to his worth and expressed their admiration of his many virtues.

Emery Davis Potter was born in Providence, Rhode Island, the 7th day of October, 1804, and died February 12th, 1896, in the ninety-second year of his age. The family removed to Otsego County, New York, in 1806. Like most of the early pioneers of our country he devoted his leisure hours to studying such books as fell, by chance, into his possession, and during the winter he attended the public schools, receiving such instruction in the branches of learning as were taught in those days. After many years of hard, earnest labor he entered the office of John A. Dix, at Coopers-town, New York. Mr. Dix was subsequently Governor of New York; later United States Senator from that state, and Secretary of the Treasury. Completing his studies, Mr. Potter was admitted to practice in New York, but soon decided to make his home in the West. He arrived at Toledo, Ohio, in the winter of 1834. His qualities as a lawyer and his high standing among the people were appreciated, and in 1838 he was post-master in Toledo. In 1839 he was elected by the Legislature as Presiding Judge of the Common Pleas Court of the Thirteenth Judicial District, covering all of Northwestern Ohio.

Many interesting experiences he delighted to repeat, in later years, relative to his traveling from county to county on horseback, through dense wilderness, and how in the absence of bridges he was compelled to swim streams and resort to methods wholly unknown to the present generation in the same section. Wild animals roamed at will in the forest; the streams were filled with fish, and in such vast quantities he often selected the size and kind desired in advance of biting. In 1843 he was elected a Member of Congress from a district embracing ten counties. In Congress he at once took a prominent position, which laid the

foundation for his great interest in fish and fishing, for the welfare and happiness of mankind, which followed him through the remaining years of his eventful life. He served with John Quincy Adams on the select committee on the Smithson will, which led to the founding of the Smithsonian Institution, now one of the most valuable and interesting institutions in the world. In 1847 we find him Mayor of the city of Toledo, and during this year he was elected to the Ohio Legislature; in 1848 he was elected to the Thirty-first Congress, where he took a specially prominent part in the long struggle for Speaker, receiving within three votes of being elected to that office. He was made chairman of the Committee on Postoffices and Post-roads, and as such was the author of the bill providing for cheap postage and the coining of the three-cent silver piece. Of this he said: "Speaker Cobb made me chairman of the Committee of Postoffices. During my first term in Congress postage was reduced from eighteen, twelve, ten, and six cents, according to distance. It was ten cents for a single sheet to any part of the country. I had been corresponding with Sir Rowland Hill and was convinced that the rates of postage could be reduced in this country without incurring debt. I introduced a bill reducing the postage to three cents, a uniform rate for all distances in the United States. I was deeply interested. The main objections came from Senator Toombs, a distinguished and polished gentleman, whose principal objection was that we had no money, no change less than a five-cent piece. I knew I had to do something to offset this plea, so I went to the mint and told them I wanted a three-cent coin made. They sent me three hundred or four hundred of the little silver pieces, so I had my pockets full when Mr. Toombs was ready to make his final speech against me. I walked over to his seat, just before he was ready, and I said, 'So you 've got no change less

than five-cent pieces—how do you like this for postage?’ I pulled out a handful of the silver three-cent pieces and as he surveyed them carefully he replied, good-naturedly, ‘I’ll give up, you have conquered.’ He voted for the bill. I afterwards got the three-cent pieces authorized by the Government.”

It was in 1853 that Mr. Potter became first interested in the artificial breeding of fish. The successful experiments were made by Dr. Theodatus Garlick and Mr. Potter, and from that time to his death he devoted his leisure to the study and work of this interesting subject.

In 1857 he was appointed Judge of the Federal Court of Utah, but declined the honor. In 1859 he was appointed Collector of Customs for the Toledo district, serving until 1861. He was elected as Senator to the Ohio Legislature in 1873, serving until 1875. It was during this term that Mr. Potter founded the law providing, at the expense of the state, for the propagation of fish in Ohio. To his personal attention and good management the successful introduction and establishment of that policy by the state was largely due. He was a member of the Ohio State Fish Commission for as many years as he thought he could be of service to the state and people. No man took greater delight in personally watching the many changing conditions of the millions of eggs hatched out in the different hatcheries of Ohio, or greater interest in distributing small fish in the inland streams and rivers.

In addition to the national offices held by him he was at various times a member of the Common Council, City Solicitor, member of the Board of Education of the city of Toledo, and there was not a fishing or hunting club organized in Toledo but what he was asked to hold some office, and was President of one association for over twenty-five years. Such part of his time as was not occupied by his business was

passed in the society of men whose acquaintance was sufficient proof of the esteem in which his talents were held, and the friendship of such men was ample evidence of his moral worth. His amiable temper, agreeable manner, and unaffected benevolence inspired all who knew him with esteem and regard. He was one of the most enthusiastic and successful anglers of our times. At the green old age of ninety he could bring to his net the gamiest black bass known in the rapidly flowing streams of our Western country, and he had that sweet and amiable disposition characteristic of all true anglers, that whether fish were wont to take his lure or not, he considered that "No recreation was so harmless and which had so many rational inducements to health and true enjoyment as angling." After a tedious winter's session of Congress he and Daniel Webster found relief in angling for salmon in the Kennebec and trout in the various streams of Massachusetts. He was a companion of John Quincy Adams and Henry Clay, and sat at the bedside of the great Kentuckian when his spirit took its flight. He was a life-long companion of the late Chief Justice Waite and Allen G. Thurman. The unselfishness of his life was most remarkable. There are different degrees of unselfishness. There are good men who are willing to devote themselves to a great cause if they may choose the part of the work that suits them; Mr. Potter had no choice. All that he asked was that the service was needed. No life can have a loftier purpose than his. His genial sympathy and good-nature attracted every person and every interest of the whole community. No consciousness of high political honors lifted him above his neighbors. A great man is always greater than any one of his actions.

The object of the American Fisheries Society is to devise means to restore to the lakes, rivers, and streams in this country the food fish supply. The members,

by study, by experiment, and intercourse with each other learned the best methods of fish culture, and by the skill which they have now acquired are able to bring into the world, by artificial means, more young fish than nature can in its ordinary course supply. Had it not been for the members of this Society, the fish industries of the great fresh water bodies, as well as the game fish for sport in the rivers and streams, would by this time be entirely demoralized, if not destroyed. Mr. Potter and Dr. Garlick watched with eager eyes the first spawn gathered in a rude box, and the result is better told by referring to Mr. Potter's address before this Society at Put-in-Bay, in 1890, where he says: "About the latter part of January the eyes appeared in the eggs, and about the first of March, 1854, there lay prone on his side, on this gravelly bed, the first baby fish artificially propagated on this continent." From this experiment has arisen an industry the benefits of which have been realized by every civilized nation of the earth. The question had attracted the attention of fishermen and the ablest scientists in America and Europe. This was the beginning of his active interest in the propagation of fish. He saw with feelings of the deepest regret that each year the hand of commerce was advancing across the waters of the Great Lakes and miles and miles of netting with its destructive tentacles extending in every direction, that in a few years our lakes and streams would be mere watery wastes. How true were his predictions we all know. In 1871 he appeared before the General Assembly of Ohio. "Gentlemen," he said, "you have but one question to consider. Shall the fish and game be destroyed from the face of the earth by indiscriminate slaughter, or shall wholesome laws be enacted, so that the future generations may share in their product? Our lakes, our rivers, and our lands are the nation's wealth. The earth only produces her fruits

by careful husbandry. Shall we neglect our waters, the great source of our riches, for the want of an economical husbandry? Or shall we let them become a barren waste, when abundance awaits an intelligent cultivation under judicious and wholesome laws?"

His interest never wavered in watching the protection of fish and game.

Anent his first experiences in "the gentle art" of angling, I quote from a manuscript penned by Mr. Potter for my use when he was in his ninetieth year: "When I was sixteen years of age," he writes, "not liking farming very well I made up my mind to go a fishing to sea. I had a colt on the farm called my own, although I had never invested any money in it. This I sold and with the money I started for New York; arriving at Albany, for the sake of economy, I took passage on a lumber sloop. Down about West Point we were becalmed and laid to. After dark, it being very warm weather, the table was set in the cabin with the windows open and the lamp lighted. We were all seated around the table, when all at once a huge sturgeon bounded through the window upon the table scattering dishes and supper in every direction. He took complete possession of the cabin, much to my enjoyment. We soon dragged him on deck, and for the rest of the voyage had plenty of what the captain called 'Albany beef.' Not finding a ship in New York I worked my way to Boston, where I found, at Long Wharf, a vessel just fitted out and ready to sail for the banks of New Foundland on a cod fishing voyage. This was just what I wanted. I had caught speckled trout in all the mountain streams of New York and I ached for a taste of the gentle art at sea. I got it. I found before the season was over that the gentle art had lost its romance in cod fishing off the banks, and oh, how I longed for the speckled trout in the clear streams of my native home."

At the age of ninety-one Mr. Potter penned me the following interesting sketch: "I am often asked what has been the cause of my robust health. I can best answer by giving my manner of life from the beginning. From my early childhood I fished the cold streams of Herkimer and Otsego Counties for the speckled trout with an alder pole, with chalk line, and angle worms, and passing through all the gradations of the art up to the rod and reel, with a book of selected flies. For over fifty years scarcely a summer has passed that I have not spent several weeks on the north shore of Lake Superior amongst the trout and bass, taking in all the favorite fishing grounds from the Soo to Fort William, including the famous Nepigon. My profession, being a lawyer (I was the first lawyer that hung out a shingle in Toledo), required close application to office work, but in the fishing season, on every Saturday morning before breakfast, I took my fishing traps and spent the entire day, taking neither food nor liquors of any kind until my return at home in the evening. My Saturday's respite from office labor I continued for nearly sixty years. I can say without boasting, although nearly a hundred years old, that I see well, hear well, feed well, digest well, and sleep well, and without any organic impairment, and can keep with my bird dogs afield from morning until night. I will say for the young people, and knowingly too, that there is no sport that brings a person so closely into contact with nature at her best as angling. It first charms, and then makes the art recreation. It leads you into the woods, where you are delighted with new scenes and sweet sounds; it gives you ample exercise for every muscle of your body. The music of the mountain brook, the cool air from the mossy cascade, the scent of wild flowers and rare ferns, and the most perfect picture of woodland beauty are all the fortunate heritage of that happy man who goes a fishing."

REMARKS FOLLOWING MR. GUNCKEL'S
BIOGRAPHICAL SKETCH OF HON.
EMERY DAVIS POTTER.

Mr. Cheney: Mr. President, Mr. Gunckel's paper on Judge Potter has recalled several things to my mind, and among them is the fact that Ohio has been peculiarly favored in the history of fish culture in many respects. Dr. Theodatus Garlick, the father of fish culture in this country, was an Ohio man; also Dr. Sterling, probably the only American who witnessed the experiments in hatching fish artificially in France by Remy and Gehan. Some time after Dr. Sterling's return to Ohio an effort was made to connect him with Dr. Garlick's experiments. He has denied over and over again that he had anything to do with them. I have three different communications from him, in which he says that he knew nothing about Dr. Garlick's experiments until called by him into the office to see the first embryo fish hatching in America, very much as Mr. Gunckel has described the event.

Another matter which Judge Potter's name recalls to me is that a large school of small fish appeared in the lake near Cleveland during the month of March. The fish were caught in large numbers and sold on the streets. Dr. Sterling secured some of the fish and to his surprise found that they were mature fish of the pike family, although only about seven or eight inches long, the females full of nearly ripe spawn ready to be deposited in a few days. The fish had no scales on cheeks or gill covers, and from this fact Dr. Sterling pronounced them an undescribed species, as the pike, the pickerel, and the muscallonge have scales on some portion of cheek or gill covers, and named the fish after Judge Potter. The school of fish disappeared and never returned, and Dr. Sterling's specimens placed outside his library window were stolen by cats, and all

he had to show that he had discovered a new species of pike was a plaster cast of a female with opened abdomen showing the ripe spawn. This cast Dr. Sterling presented to me before his death and I still possess it, but the cast is not fine enough to show the absence of scales as Dr. Sterling declared in his letter to me. He had some correspondence with all leading ichthyologists regarding the fish, including Dr. Bean, I think, but he could not present specimens of the fish, and all that remains as a souvenir of the school of small pike is the cast in my possession, on the back of which is the inscription: "Pigmy Pickerel, *Esox Potteri*, March 22d, 1877."

Mr. Mather: I move that a committee be appointed to draft resolutions expressive of our regret at the loss of Judge Potter; and also that we restore to our list of members a list of those who are deceased, after the manner of our publication some years ago. Perhaps this should be two distinct motions, however. Within three years the publication of the names of our deceased members has been discontinued. Before that time they were always kept on a roll of honor; and I move you, sir, that that roll be restored.

Mr. H. Whitaker: Before the motion is put I want to say a word. The death of Judge Potter, it seems to me, is a subject fitting and worthy of the attention of this Society in the manner indicated by Mr. Mather. We are today on the threshold of our twenty-fifth anniversary. While the legends connected with fish culture show that Jacobi, of Germany, Gehin and Remy, of France, were in advance of anything in this country in the way of artificial propagation of fish, yet nothing of practical value grew out of these discoveries for many years. Today we have a word to say with regard to a man who was one of the most interesting men connected with the genesis of fish culture, and its discoverer in this country and a witness of its great development.

I think we live in an age wherein more progress has probably been made than in the five or ten decades that preceded it. The utility of the electrical developments, the creation of the type-writer, the telephone, and a thousand other devices are well known to us all, and yet when we consider fish culture today we scarcely reflect that it is barely a quarter of a century old.

Those of us who were present at the meeting at the Beebe House at Put-in-Bay, I think were all impressed with the remarks made by Judge Potter upon the hatching of the first trout, which has been referred to in the paper read by Mr. Gunckel, and his language was most graphic. He was at that time an octogenarian, and his seemed like a face from the past to the younger members. There are other claimants for the honor, but the credit for the hatching of the first trout in this country undoubtedly belongs to Dr. Theodatus Garlick. Judge Potter described in the most graphic manner, as I say, his visit to that hatchery, if you may so term it, which was located upon a small rivulet in the outskirts of Cleveland; and I shall never forget the effect that it seemed to have upon the Society when he related that historical event.

I most heartily support the resolution, and I trust that in addition to the memorial paper that has been read connecting Judge Potter with these early experiments in fish culture, we may have a brief resolution of respect, in this way showing our regard for the Judge and for the work with which he was connected.

The President put the question on the motion of Mr. Mather, which was carried.

The President: Was the number of the committee named, or what number will you have?

Mr. Gunckel: We will leave that to the chair.

NATURAL FOOD FOR TROUT FRY.

BY FRED MATHER.

Half a dozen years ago, more or less, a fish culturist in Europe published an account of his experiments in rearing trout fry on natural food, which he had learned to produce in great quantities by a process which he would not divulge. His system included a supply pond, where the living food was bred, and a series of small pools, which served as temporary pastures for the fry until the food in one was exhausted, when they were to be driven into another pond, as cattle are changed from one pasture to another. This man's article was translated into many languages and was published either in the Annual Report of the U. S. Fish Commission or in its Bulletin. At present, while writing this article, my library is packed away and it is not possible for me to quote the volume or to give the name of the gentleman who originated the idea, but I have stated his main plan and remember that the secret process of growing live food was offered for sale to me, as no doubt it was to other fish culturists, but for two reasons I paid no attention to the matter; one was that I never cared to buy any secret, and the other that the plan seemed to be impracticable on any scale such as we use in America. The plan of driving small trout from a grassy or weedy pond condemned the whole thing, because they do not drive well, and in such a pond many would remain and keep down the expected

increase of food, and so the wonderful scheme was dismissed from serious consideration.

A while after the first announcement of this discovery of how to rear trout without expense, it leaked out that the process was to use the dung of animals in water to grow diatoms by the million, and the diatoms in turn would furnish food in plenty for the smaller crustaceans, as daphnia, cyclops, gammarus, and perhaps other forms of life on which young trout thrive in a state of nature. This was perfect in theory, but I still was skeptical as to its value in practice, and the scheme passed from memory until it was brought before this Society two or three years ago and lightly discussed. You may remember that Mr. Frank N. Clark said that he had experimented a little in this direction with several forms of ordure, but had produced no results that were satisfactory to him. Last summer I had leisure to try this scheme, and will give the result of the experiments.

There was a dripping fountain in my yard supplied from springs in the hill above, which also supplied a portion of the water used in the state hatchery, on lower ground. This fountain was supplied by a $\frac{3}{4}$ in. lead pipe, and the water trickled and dropped over rockwork into a basin, and from there the overflow went through a series of small pools in my garden, where the year before several species of wild ducks had been confined. An examination of the water in the first pool and also in the small open pond above, which caught the flow of the several springs, revealed the fact that it contained the forms of minute life named above, as well as rotifers, hydra, snails, and several kinds of water insects, as well as their larvæ. Therefore, all the conditions seemed favorable.

For the benefit of those who have paid no attention to the minute forms of life which it was proposed to breed, it may be well to say that diatoms are invisible

to the unassisted eye except when in mass, as we often see in swamps, where they appear as an iridescent scum on the surface of the water in still places or in the spoor of some heavy animal. They were formerly supposed to belong in the animal kingdom, but are now classed among the lower forms of algæ, and have a shell or case of silica, which passes undigested through fish and turtles. These diatoms form the principal food of the oyster, and naturalists have recorded and named something like 4000 species of them, but we will not go into the subject so deeply. Suffice it to say that the microscopic vegetables can swim in most cases and supply food for animals also microscopic in their young stages, such as the daphnia, cyclops, and other forms of entomostracans which in turn feed young fishes.

To be complete such experiments should begin in February, when the earliest trout of the year may begin feeding; but these experiments began in April, in time, however, for the production of food for the later hatch to get their first meal. The water now on Long Island was a trifle warmer and presumably more favorable to the production of such life as was desired. The temperature of the water during the season was as follows, mean temperatures only for each month being given in scale of Fahrenheit:

	Rockery.	1st Pool.	2d Pool.	3d Pool.	4th Pool.
April	56.5	58.10	59	59.75	60
May	58.5	60	61.25	62	62.10
June	62.75	64.10	65	65.75	66.25
July	69.25	73.25	75.10	76	78
August.	72.75	74.5	76.25	76.75	77.50

With August the record ended. Neither time nor inclination allowed further observations, for the season had covered the production of food during the most critical period of the life of a baby trout.

The "Rockery" received the first water from the

spring pond, already mentioned, and in the basin at its top was placed both old and fresh cow ordure weekly. In the first pool there was a division of the water, and in one half horse dung was frequently put, both fresh and stale, and in all the pools was a deposit of duck dung of the previous year, well dissolved, and stocked with all the forms of life which it was thought desirable to cultivate. At different times water was taken from each of the five places in this way: One gallon from the surface by immersing the measure, one gallon from the middle and one from the bottom by means of tubes, and the contents filtered through No. 8 wire cloth, cheese cloth, and then through the finest of mill silk bolting cloth. The last would retain almost all but the smaller diatoms, and they were caught in a funnel of filtering paper below all the other strainers.

This work, being done twice each month for the five months including April and August, should give a fair average of the amount of food in the pools during the season in which the operations were conducted. The following gives the amount of entomostracans obtained, and excluding snails and the diatoms. In other words, the amount of food available for trout fry in their first season, such as they can see, seize, swallow, and assimilate. The pools contained about 150 cubic feet of water, or 1125 gallons, of which 15 gallons, or $\frac{1}{75}$, were strained on ten different days, at the 1st and 15th of each month.

Of the above-named food 2.25 grams were caught, equaling .225 grams per day. This multiplied by 75 gives us 16.875 grams for the entire water per day, and again multiplied by the 153 days gives a total of 2,581.875 grams in the whole season. Dividing this by 24 gives us 107.578 oz., a trifle less than $6\frac{3}{4}$ lbs. avoirdupois.

We must consider the fact that no fish were feeding in these pools, and that the calculation is made as

if the animals lived only one day and were replaced by others. This is not the fact, and how long they may live I cannot say, but if each individual lived a week the amount of food produced would be less than 1 lb. in the entire season, as the calculation is for a daily renewal of all life. Two hundred baby trout could have lived there during the first week of their lives and fed well; after that time, when their appetites began to get sharper, say in a fortnight, all the food to be found would be just what came in the water supply, and that would not have fed half a dozen when two months old. If I had been skeptical of the practical utility of this scheme before this experiment there has been nothing to convince me of error; still, if other trials under other circumstances show that it is practicable to raise enough natural food to rear 20,000, or even 10,000, to be six months old, I must try the plan which has proved to be successful. While writing this I do not know that any other men but Mr. Clark and myself have worked in this field in America, still it is to be hoped that they have done so and that they will publish their experience. Such work is very interesting to one who has a taste for it, as most fish culturists have, and this paper may stimulate others to similar trials. I think one plan was to have a number of separate ponds in which to breed the food and to tap them in succession, and allow each one to furnish food to the fish, which were not to be driven to the pasture, but to remain in one pond and get the food supply from different sources at different times. This is certainly the best plan, as any trout breeder will certify, because it is a difficult matter to get the last dozen trout from a pool containing vegetation or hiding places of any kind. At present writing I have less faith in the scheme than when I began to experiment with it.

DISCUSSION ON THE PAPER OF MR. FRED MATHER.

Mr. Mather: I wrote this paper on this subject, and I have been trying to find out if I had changed my belief. I did not believe in the thing, and considered it a humbug; still, as it has been published far and wide, I wanted to see what the results of my experiments would prove; and I am still convinced that the whole thing is as much of a humbug as it struck me when I read the first accounts of it.

Mr. Titcomb: Have you tried the effect on the fish in the old pond, where the temperature was seventy-seven degrees?

Mr. Mather: Yes, they lived there in warm weather. As I understand this man's plan, it was to have the reservoir in which to breed the food, and then let a little stream go through and carry the fish into the colder water, where the trout were. Most of them, you know, are very small, and they live in water of a great many different temperatures; and while they were bred in this water, these pools in August were too warm for trout, but not in the early part of the season, up to July.

Mr. H. Whitaker: I do not care to start a discussion on this paper, but there seems to be no disposition on the part of any one else to do so. I think it is a paper that should challenge the attention of every fish culturist in America, and I think the thanks of the Society are due to the author for bringing a subject of this kind up for discussion here. I believe it must appeal to every man interested in fish culture that there is a great sentiment today in this country in favor of the artificial breeding and rearing of trout for the market. I believe it is the proper function of boards of fish commissioners, and particularly the United States Commission, to investigate this subject.

We do know that liver 'fed trout are of little account for market fish; you must give the natural food of the fish to them, in order to get a marketable fish and an edible fish. There is no question that in Germany, in Scotland, and in England this subject has received great attention, and that fish culture has been entered upon by private individuals in these countries, I believe, with profit.

It seems to me that with the large amount of means at the disposal of the United States Commission they ought to take the lead in investigations looking to the rearing of trout for the market. There is hardly a day passes in the experience of any man connected with the industry, I fancy, that he is not inquired of with regard to this subject of raising fish for the market. I believe that Mr. Mather's experiments go to show what he states they do, and that such progress is being made in this line as necessitates just such experiments as Mr. Mather has made. It is only a step, but I am satisfied in my own mind that within the next decade or two, if this matter is properly followed up, we will have many waters under private control in all the states of the Union that will produce a great many pounds of fish annually, to the profit of the men who own the ponds.

I have no doubt that many of you have seen the most valuable book that has been called to my attention within the year, published by Mr. Armistead, "The Angler's Paradise." In my opinion it is one of the best books on fish culture that has been published. He deals largely with this question, but does not go into details in regard to it; but that he is running a place in his country, at a profit, is beyond question. Now, considering that America has not advanced as she should in the artificial propagation of fish for distribution in public waters, it seems to me that it is incumbent upon us as fish culturists to take the matter

up and follow it out and if possible make it a success. There are certain objections, undoubtedly, to the marketing of fish by private individuals; but the public good must first be given attention. If barren waters can be made productive, so much has been gained, so much has been added to our substantial food economics. I think if this matter is followed out a just conclusion will be reached, and some will, at least, reap the glory of having bred and reared enough of the food of fish to make the breeding and marketing of fish a practical thing in this country today; and I would like to hear from some others on this subject.

Mr. Mather: I would say for the benefit of Mr. Whitaker, that Mr. Hansen, a member of this Society, whose address has escaped me for the moment—

The Secretary: Mr. G. Hansen, Osceola, Wisconsin—

Mr. Mather: Mr. Hansen is now breeding trout for the market profitably, he writes me, and it was a question with him whether he could reach the New York market. He says his market is limited. He can raise any quantity of trout, but cannot get the price for it. There is no demand for them in his section. A few hotels want them, and he wrote to me to see if I could make some arrangement whereby he could ship the trout to the New York market. He has got more than he knows what to do with.

Mr. Whitaker: Does he raise them on this kind of food?

Mr. Mather: No, not on this kind of food.

Mr. Whitaker: What kind?

Mr. Mather: I cannot tell you.

Mr. Whitaker: If they are fed on liver he will not find much of a market for them in New York.

Mr. Mather: I am not willing to agree that liver fed trout are not good trout. I find them good to eat. Liver is a pretty good article of food, and I can make a

good breakfast on liver. There is a kind of sportsmen who go into the streams and get wild trout—I have myself gone into the woods hungry enough to eat a jackass, and cooked my own trout and eaten it half raw, and declared that it was the finest trout ever cooked on the face of the earth—but if a man ever served it to me in a New York restaurant, it would be sent back. I have eaten trout fed on liver that I consider good trout.

Mr. Titcomb: I have been interested in the remarks on the subject of natural food for trout, and on the subject of marketing trout. I have been interested in a hatchery unfortunately so situated that at certain seasons of the year the water is more like mud than water; but I have found that if the eggs of the trout and the fry be carried beyond the sacking period, the mud is full of food for them.

I have not experimented as Mr. Mather has in confining the fish and getting at the actual supply of food. I could only gather my knowledge from the action of the fish themselves. The stream I refer to flows in a valley for a long distance, and has the water shed from both sides, and it seems to get all the fertilizer which is put on the farms above the station, and therefore in a way the fish get the natural insect food, but there would be days, you might say a week at a time, when the water would be so impure, so roily, that the little fish could hardly be seen. During these periods it did not seem necessary at all to feed them. They did not seem to care for the artificial food, but were lively, keeping up toward the head of the stream as if all the time on the alert for food, natural food, and I found that they thrived in that way nicely.

I feel very much as Mr. Mather does, that this question has not been solved, and that we must make a study of it in the future; but from my experience in the plant referred to, I am in hopes that it will be

solved some time, and that we can find a natural food.

Relative to commercial hatcheries, I have visited several that are commercial hatcheries, notably those of Mr. Hoxie, at Carolina, R. I., Mr. Gilbert, Plymouth, Mass., and Mr. Hurlbut, at Freetown, Mass. Of these three, the one at Carolina and the one at East Freetown, the food supply at those stations is entirely liver. At Plymouth Mr. Gilbert has a more natural preserve for his trout, that is, the waters approach more nearly to nature. They are located in a cranberry bog—some of you may have seen them. He makes quite as much out of his cranberries as from his trout; but in addition to the large pond for the preserve, he has a long stream, which affords a flow of water naturally through the bog, marshy on both sides, the natural substrata of soil being sand; but on each side of the stream, if you step off the plank walk, you get into the water. It is very wet. You turn up any of the shrubbery growing along the bank of that stream and it is alive with shrimp. Mr. Gilbert claims that the trout in that stream get as much natural food as the food he gives them, which is artificial. I have eaten trout taken from his ponds which appeared to me as good as natural wild trout; and I have eaten trout from Mr. Hoxie's ponds, and I must confess I could not tell the difference between those trout and wild trout.

I have eaten trout weighing two pounds—that is to say, a part of it—which was kept at the State Hatchery in Vermont until they weighed two pounds, during the early season, when the water was cold, which seemed to be as good as any wild trout. In speaking of wild trout, we know that the wild trout in different waters will vary as to quality of food. If you take a wild trout from stagnant water where the food is plenty, they do not seem to taste as good as trout taken from more lively, cooler water. I simply bring

up this experience to add to what Mr. Mather has said.

Mr. Mather: There are three mill ponds. In the upper one, the trout about the first of April and along through April are quite edible; from the first of May, after the rains get started in, the trout taste muddy, taste like good fresh water fish out of a muddy pond.

In regard to the natural food, of course there is enough natural food in almost all the streams to support a limited number of trout; but the point of my remarks and my paper was this—that where you have ten thousand trout, say in a little artificial pond, perhaps not over twenty-five feet by ten feet and a couple of feet deep, and they are about as thick as they can stand and swim, they have got to have a good deal more food than will go into the water naturally; you cannot breed in any such pond as I undertook to work this last year.

Mr. Titcomb: You must have a greater water area?

Mr. Mather: Yes, sir.

Mr. Annin: I would like to say a few words. I agree with Mr. Mather. I do not think it is possible for any one to breed naturally food enough to run more than a small pond, where you are rearing ten or twelve or twenty thousand small fish, and to support them. You have got to have them artificially fed. You see in the fish business the rule is to make money, sell trout; and upon inquiring into the circumstances connected with it, invariably you will find that they have a big pond, and a pond that is breeding natural food itself, and does it to such an extent as to produce natural food enough, so as to carry lots of trout. I think you would find in many cases that they can raise natural food to run through and feed your fish, so that you can produce enough of them to make it

pay. Mr. Hansen, in Wisconsin, is feeding natural food, that is, allowing natural food to pass through the pond. He gets the benefit of that, and he also is feeding them. He is feeding everything that he can find in the way of artificial food.

Mr. Whitaker: There is a misconception regarding the point we are getting at; at least so far as my remarks are concerned. I would not suggest for a moment that this matter of natural food should be gone into in connection with fish culture in ponds. That is not the point. We can carry all the stock fish we want under present conditions with liver fed fish; but that is not the question. The question is about rearing fish for market by the individual. There is no question that with the proper amount of air and with the proper installation of aquatic plants in ponds, you can very largely, and perhaps altogether, furnish the amount of food that is necessary for the sustaining of trout and to bring them into excellent condition. But what, it seems to me, we ought to look into is the question of adding, if it can be, to what these persons who have been experimenting in this line claim to have done here. I believe that something still may be added, and that is one of the things we ought to give attention to.

I agree with Mr. Annin in his remarks and with Mr. Mather; but I believe that Mr. Annin admits that no fish culturist who carries his stock fish in ponds can be bothered or embarrassed with aquatic plants or anything else. He must have his pond in such order that he can handle them, and they must be liver fed. The writer of the paper said he was so hungry he could eat a jackass, and did eat a fish that was partly raw. I do not believe it is necessary to pass judgment on that kind of an epicure, and therefore I shall have to dismiss that part of the subject, because he carries a stock in his pool.

Mr. Cheney: I do not know who the foreigner is that Mr. Mather referred to, but it may be Mr. F. Lugin, of Switzerland. His process has been published in the bulletin of the United States Fish Commission and also in the proceedings of this Society, that is, so much of it as is known to any one but the inventor. I think it was copied into our records two or three years ago.

There is a gentleman now in Europe who has been investigating Mr. Lugin's methods. He cultivates about one hundred thousand yearling trout annually, and he rears his trout on small insects, daphnia, cyclops, and fresh water shrimp. The gentleman referred to who is abroad investigating the matter is a director of the Adirondack League Club, and is expected home within the next month, when he will bring home with him all that he has been able to learn about the matter. The inventor of this process, if it may be called so, and he does call it a secret process, declares the details of rearing the trout food has never been given out to any one. Visitors have come, observed, and gone away; but he has never had occasion to give its details to any one. I am waiting with considerable interest to see what the New York investigator will report when he returns. He writes that the plant can be enlarged. It is a mere question of adding to the rearing troughs or basins. Lugin's plant provides for rearing only 100,000 trout a year, as that is all there is demand for in Geneva, but he claims that it is only a matter of increasing the number of food basins to enlarge the plant to a million or more fish, as the basins create their own food. There is another foreign experimenter whose methods are similar in one particular at least to those followed by Mr. Mather in his experiment, and this is Carl von Scheidlier, an Austrian fish breeder, but he professes to have several methods. All of these secrets all grouped under what

is called the von Scheidlin-Rakus system. As near as I can learn from correspondence this system is entirely different from the method followed by Lugrin.

Mr. Thompson: I have had a little experience with trout fry, and I believe it is the same with trout fry as with a child, horse, cow, or any other living thing. Taking trout fry in quantities such as a man will have to raise for a state hatchery or marketable purposes, it is impossible to get the amount of natural food out of any place where you can put the fry to grow them. Take a child or a colt and starve it in its youth, and it will be a starved man or horse to the day it dies. It is the same thing with trout. You can take trout fry and feed them and take care of them and grow them; I don't care what the food is you feed them, provided it agrees with them and they get enough of it to live on, they will go ahead. Of course, if you can give them natural food, so much the better. But my experience has been within the past few years, and I have had quite a little—and I can show you this year's trout three inches long—

Mr. Cheney: Three inches?

Mr. Thompson: Yes, sir. I will do it tomorrow, if any gentleman cares to come with me. I will show this year's fry three inches long. They have not received any artificial food so far, and I will show you thousands of others that are fed and taken care of, running from one half to two inches long, and I will show you year old trout weighing one quarter, three eighths, and a half-pound.

They are fed from a series of ponds. I will show you 20,000 fish in a pond not much larger than this room, very little, if any. I will show you a fish that will average from a quarter to a half-pound. This fish has been fed regularly. When a man says that he cannot raise trout, and raise them profitably, in my opinion it is because he does not pay attention to it.

If you will feed a child once a day, it may live and get along in a certain way, but if you feed it three or four times a day it grows better ; and if you will devote the same attention to fish, and feed them often, I think you can raise fish fast and profitably.

The place I have reference to is on Long Island, well known to very many here, I presume. We do not feed to the fish which we eat any artificial food whatever. We grow a fish until it is half an inch, and then turn it down to the lower pond, and they do not get any more artificial food. We do not feed any artificial food during the month of October, when we prepare to turn them out to spawn and let them go down to the lower pond. In the upper pond we feed and grow our fish as fast as we can, until we get them a size large enough to catch, and then we let them down to take care of themselves. In that pond we have the tide water. The only thing between our lower pond and the tide water is an inch mesh screen. The tide ebbs and flows into that pond the same as in Long Island Sound. We have a pond about one hundred feet wide and twelve hundred feet long, and in it there are about 20,000 fish ; and I guarantee that you cannot catch a poor fish in it, one that is not in flavor and condition equal to any fish, I do not care where you look for them. This has been our experience, and I would like to have any gentleman in this room visit the place and take a look at it.

Regarding this animal food, etc., I cannot talk from experience with our fry. It is getting this animal food. There is a little spot where I put down a six-inch pipe and get fifty gallons of water a minute, just as clear as air, and there I have my fry. They are doing well. It certainly is not from the manure that washes down or anything of that kind. I will show you fry that have never had a particle of artificial food ; and I say that they are away ahead of those that

are fed. Of course, there are not so many in the same space; but in a space four feet wide, twice the length of this room, there are probably two thousand that are left there, that I did not get into the artificial strip and hatch.

I believe with a hatchery eight feet wide and four hundred feet long, with plenty of spring water, all that is necessary is to pull up the screen, and simply let enough fish go in in two hours. I put in six inches deep of clean, white beach gravel, and let them go in and deposit their eggs. I let about two thousand fish go in there. Of course, we do not get as many fish as some other fisheries do. We calculate only to raise about ten thousand fish a year, which is as much as we care to have; and we have, perhaps, thirty thousand fry that are fed artificially. The natural fed fish are certainly ahead, but it is true that they have a little more space. I do not care how much you feed artificially, I do not think it affects the flavor of the fish in its early stages of growth. You should feed them for the first year, and get them so that they will be a good size. The first consideration for any person who wants to raise fish for market is to get size on them, and then there is enough natural food to be had for fish. If a man raises fish for the market on the border of the seacoast he can get any quantity of minnows and shrimp. I have found a good way to grow fry—it may not be convenient for you all to do this—but I can find any quantity of large minnows, almost as large as your finger, and you can catch a bushel of these, put them in a barrel, and run in a little jet of steam; and in about an hour you can steam them so that the meat will peel off from the bones, and you can give the natural food to your fish. You can take and do the same thing with your large fish, and you can grow them and grow them profitably. A man can grow fish for the New York market and make money.

Mr. H. Whitaker: You advocate taking as much care of them as possible for the first year, to give them size, and then turning them out for natural food?

Mr. Thompson: Yes, sir; I agree with Mr. Mather that liver tastes good sometimes, but we do not believe in paying a dollar a pound, and you and I and any man knows we can buy liver for less. We like good calf's liver, but we like other things with it, a little salt and pepper, butter, and a nice piece of bacon fried with it, and then it may be very good, provided we are hungry; but when we go into a place and sit down and pay a dollar for lunch, we do not care to have liver fed fish. We like a natural trout. I can easily detect the difference between a liver-fed fish and a fish fed naturally from a river.

Mr. Titcomb: You have spring water, and food naturally coming from the water, as I understand it, out of the ground?

Mr. Thompson: It bubbles right up.

Mr. Titcomb: Apparently a natural spring?

Mr. Thompson: An artesian well. We feed that artificially.

Mr. Titcomb: I thought you said they got their own food.

Mr. Thompson: There are some on the side pond. I will refer to an experiment we have been trying this year. We thought that probably we took a little too much pains to clean our ponds out too well. I found a little place that was made a year ago. I tried to grow some there, but did not have as good success, and did not grow them as fast as I did this year, and the place has not been cleaned within the year, there being a certain growth of fungus that comes up, water grass, etc., and we let it stand and it stores more food for us than in years before.

Mr. Annin: I think it would be right to correct one opinion that might go out in this discussion. I

think all the old fish culturists are acquainted with the fact that there is no water in the United States so good to grow brook trout as the water on Long Island. There are no waters that are tide waters that have got the amount of natural food, and where the temperature is so favorable, and the trout will make such growth, as they will there. Going up into Western New York or Michigan, it is impossible to bring fish to that size in the same length of time, I do not care how much you feed them.

Mr. Thompson: You will have an opportunity tomorrow to see your old fish that will measure nine inches in length.

Mr. Annin: I do not doubt that in the least. Ten years ago I saw trout near Jamaica that weighed half a pound, and was only one year old. I would not believe it until I was satisfied the man was telling me what was the truth. After that I investigated more about the growth of trout on Long Island and I am satisfied they cannot say too much about them.

Mr. Thompson: I raised a fish and sold it to Mr. Blackford a number of years ago—the first time I met the gentleman. I went into the experiment some fifteen years ago, and sold him a brook trout weighing four pounds ten ounces, just three years old, raised from the egg.

Mr. H. Whitaker: Mr. Annin's remarks are quite applicable. I have a vivid remembrance of our visit to the South Club on Long Island, something like two years ago. The fish shown there were a revelation to me. I never saw anything to compare with their yearling fish and two and three years old fish. They were marvelous. In the interior it is impossible to do it. There is no question that fish having the advantage of going to tidal water have a far greater growth than fish that are confined entirely in fresh water. That

accounts for the marvelous growth that Mr. Thompson refers to, undoubtedly.

Mr. Mather: While on this subject, I was in hopes that somebody from the United States Fish Commission would be here today who could tell us about Mr. Page's success. He is advocating the feeding of mush; I think he uses middlings, mixes it with his liver and other things. He is the only one who has advocated the feeding of any vegetable food to trout, and I should like to hear from some one who knows something on that subject.

Mr. Thompson: I can answer the question of my friend in regard to feeding mush. I had a gentleman ask me that question, what I was feeding my fish on, and I told him Indian meal. I was doing nothing of the kind. He had a pond with a number of fish in it, and that man went home and boiled Indian meal and fed his fish on it, and he is feeding it today; and I have to state that he has as fine fish as any in the state of New York. (Laughter.) That man supplied the Waldorf with trout grown and fed on Indian meal. It is a fact. I will tell you what he did with it. He did not feed liver, and I have never fed a pound of liver in my life. I take clean beef hearts and lean beef and grind it up as fine as I can. He took these beef hearts and ground them up, and would put probably four beef hearts in a large kettle that he had, and boil it thoroughly, and after he got it thoroughly boiled, thicken it with Indian meal. I never saw fish, as many in the same space, that grew as these fish did.

Mr. Annin: I used Indian meal in two places for one year. I cooked the meal separately, but it is not a success unless you cook it rather thick. When it is cool and it is not thick, it will give with the water; a big fish will strike at a chunk, and what he gets in his mouth he will take, but the rest will settle down. It is a bad thing for a small pond. I have given it up.

Mr. Thompson: This gentleman has not given it up. He feeds it every day, and has done it for the last two years. One year he reared about thirty thousand fish in a pond certainly not more than twice the size of this room. He is still feeding the Indian meal.

Dr. Bean: I can answer one of Mr. Mather's questions about the result attained by Mr. Page in feeding rainbow trout with mush made of mill middlings and mixed with liver. I have been at Mr. Page's station, Neosho, Missouri, and have seen there hundreds of rainbow trout twelve months old, which would average pretty nearly twelve inches in length. That is, I think, rather unusual. He gets larger fish, but these, I am quite certain, averaged as much as twelve inches at twelve months old. I do not believe that any other trout than the rainbow will take this diet and thrive upon it equally well. It may be that the brook trout will eat it, but Mr. Page did n't succeed in getting such results with any other than the rainbow trout. He cooked the middlings thick, mixed raw liver with it afterwards, and fed it thick. I have seen the trout rush at it as if it were *gammarus* and *daphnia*, or anything they are supposed to like better than any other food.

Mr. Annin: I fed fry two months old, and used bolted middlings, same cooked separately, and passed it through the finest blade in the meat chopper, thirty-second of an inch blade, mixed with the liver, and when it came out it was thoroughly mixed. We would feed our two months old fry on it. That did very well, but we had to be careful about the troughs. It would slime the whole bottom of the trough.

Mr. H. Whitaker: We do not know what can be done until we find out. Mr. Thompson is a benefactor to his race, but he did not know it at the time. On the question of feeding meal middlings, my attention was called two years ago to an experiment made by a

man who had nothing to do with fish culture; and in some place down in Indiana—and Indiana's waters are not first-class—was the owner of a grist mill. Under conditions that were purely artificial he introduced into his pond white fish, and he has been feeding them on cooked middlings, I think, mixed with liver or something else, at any rate, largely middlings, and it is claimed to be a great success; so that we do not know what we can do until we try.

Dr. Bean: That is Thompson, at Warren, Indiana.

Mr. Whitaker: I understand that it is a fact.

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NEW METHOD OF POND CULTURE.*

BY DR. JOUSSET DE BELLESME.

(TRANSLATED BY DR. TARLETON H. BEAN, DIRECTOR OF THE NEW YORK AQUARIUM, BY PERMISSION OF THE AUTHOR, AND READ AT THE 25TH ANNUAL MEETING OF AMERICAN FISHERIES SOCIETY.)

[At the solicitation of Count de Briey, President of the Central Society for the Protection of Fresh Water Fisheries of Belgium, M. de Bruyn, Minister of Agriculture, requested Doctor Jousset de Bellesme, Director of Fish Culture of Paris, to deliver a lecture on pond culture at the Exposition of Fisheries and Fish Culture at Antwerp in 1894. That lecture was published in the journal of the Belgian Society mentioned, in January, February, and March, 1895.

Dr. Jousset de Bellesme had previously published a brief account of his new method of pond culture in *Comptes Rendus Acad. Sc.*, Paris, Nov. 26, 1894. A paper upon the same subject was published in a French newspaper, *Le Gaulois*, by A. de Marcillac in March, 1895, criticising the method proposed by Dr. Jousset de Bellesme, and in *Revue des Sciences Naturelles Appliquées*, Paris, No. 17, December, 1895, M. Jules de Guerne takes exception to the statements made by the Director in terms unnecessarily severe;

* Nouvelle Méthode de Culture des Étangs, Par le Docteur Jousset de Bellesme, Pêche et Pisciculture, Brussels, Nos. 1, 2, 3, Jan.-Mar., 1895, pp. 2-11, 28-40, 50-54.

indeed, in such a manner as to arouse suspicion of an unworthy motive.

There is no question as to the value of the experiments herein described, and however much American fish culturists may differ from some of the distinguished author's opinions, they cannot fail to find in the article many useful hints for their guidance. We have to thank him for the information that the quinnat salmon will reproduce without going to sea when three years old and weighing thirteen to fifteen pounds, and that they can be successfully and profitably reared in ponds.—T. H. B.]

In Belgium, as well as in France, ponds have not taken the rank to which they are entitled in increasing the food supply and supporting industries because, instead of constantly improving their system of culture, the breeders of fish have remained hypnotized by obsolete methods, and have found nothing better than the indefinite perpetuation of the carp, which has been practiced from the thirteenth century.

It is desirable to abandon this plan and in this progressive age to give up ancient errors. After I have shown the result of the extended researches which I have made into this interesting subject, I hope all your doubts will be removed and you will be convinced, as I am myself, that pond culture is susceptible of taking its place in the first rank of fish cultural industries.

At present it is rare that a pond suitably located yields sixty francs per hectare of surface, and again how often they do not give more than a revenue of thirty or forty francs per hectare every two or three years. It will be admitted that with such meagre returns this industry will be greatly neglected.

I hope to demonstrate to you that if this had been differently managed the culture of the pond might be made to yield seven hundred, eight hundred, or even a thousand francs per hectare.

I will divide my subject into two parts :

First : I will give a rapid survey of the present state of pond culture.

Second : I will have the honor to show you the new method which I have evolved from experiments continued about ten years at the Aquarium of the Trocadéro in the rearing and reproduction of the *Salmonidæ*.

* * * * *

I have often asked myself why the monks especially selected the carp among the numerous fishes which inhabit our fresh waters. Of course we can offer nothing but conjecture upon this point. My belief is that the carp of the fourteenth century was not exactly the fish which we know today, and that it was distinguished then from other species by qualities which it no longer possesses.

* * * * *

I fear that what I am going to say will excite contradiction, and I will be sorry if any one attributes to me bad intentions with regard to a fish which gives pleasure to the angler and is sought after by many people ; but the love of truth leads me to state that from the culinary point of view and as a food the carp is far from occupying the first place among the fresh water fishes which are offered in our markets. It ranks in the quality of its flesh below the salmon, trout, eel, and frequently even the perch, gudgeon, and barb. If any one disbelieves this statement it can be sustained by a glance at the list of prices of fish in our markets. It will be seen that while a kilogram of salmon costs ten francs, of trout eight francs, of eel seven francs, and of gudgeon five francs, a kilogram of carp costs about three francs. These are the average prices of the Paris market. Three francs a kilogram ! Who hopes to establish that at this price the carp is an advantageous food ? Leaving out the always dis-

puted question of taste, the food value of the fish must be considered :

Buy a carp of one kilogram ; cook it ; it will not weigh more than	991.80 grams
Remove the skin and weigh it ; it is	96.90 grams
Take out the viscera, which weigh	379.76 "
Carefully remove the skeleton	201.78 "
There remains of flesh only	312.36 grams
Thus, from this fish for which we have paid three francs, we obtain only three hundred and twelve grams of flesh ; that is for the flesh almost at the rate of ten francs per kilogram.	
If we take a salmon or a trout of one kilogram, see what we obtain ; after cooking it weighs	965.70 grams
Skin	49.90 grams
Viscera	199.80 "
Skeleton	122.10 "
Flesh	593.80 grams

It is unnecessary to emphasize further the inferiority of the carp.

How then comes it that, in spite of this inferiority, which has doubtless been remarked and commented upon by many other persons than myself, the carp still continues to be the only fish cultivated in ponds? There are several reasons for this ; the carp really possesses several valuable qualities from the point of view of the fish breeder. Of all our fresh water fishes its growth is the most rapid. At four years it weighs two kilograms, and frequently arrives at this weight earlier.

It is extremely hardy and is not injured by freezing nor by impurities in the water. Its culture is attended with uniform results ; finally, the carp requires less care than other fishes. Its food is vegetable, and one may really say that this fish raises itself. This, indeed, is the principal cause of its success ; many proprietors are satisfied with small results upon the condition that they do not cost any trouble.

I said at the commencement that this method is to be abandoned. Every medal has its reverse. We may say that the hardness of the carp has been the origin of its degeneration as a species. The fish culturist grows careless about the selection of the breeding fish, and very often before having his attention called to it the carp have spawned in the pond quite promiscuously. Nevertheless he sells the young for re-stocking at the same price as if they had been of a good race; also through this negligence the pond deteriorates, as in Sologne, where the carp has greatly degenerated and has acquired a factitious quality of reproducing too early. The Sologne people have remarked upon this without comprehending its significance. They say in this connection that the carp is precocious.

As a result, it frequently happens that the alevins placed in a pond to grow begin to breed before they have reached a marketable size, and they have no commercial value. This characteristic has been acquired by living many generations in ponds which are too warm, and has become fixed by heredity. High temperature stimulates the reproductive functions and the animal becomes incapable of growing large.

Is it advisable to cultivate such a mediocre fish? Here are some figures which will answer this question, and without burdening you with a long and detailed enumeration I will furnish the two extreme terms of this series.

First, the minimum.

In 1892, in Sologne, the proprietors of ponds had difficulty to sell carp at seventy centimes a kilogram. After deducting four per cent. and the expenses of fishing, which would give about fifty-two centimes a kilogram, and as a hectare produced an average of not more than eighty kilograms, this is a yield of about forty-five francs a hectare; but it should be noted in

this regard that the ponds are not fished oftener than once in two or three years. Certainly this is small, and indeed some ponds return sixty, seventy, and even eighty francs per hectare.

The most highly esteemed carp establishments are those of Dubisch in Silesia, which have frequently been mentioned of late years, and have given the best results. A hectare has yielded, according to official reports, as high as one hundred and thirty-two francs, a result which has never been exceeded; but this method involves much care and labor. This is a very excellent result, but how insignificant compared with a yield of seven hundred francs per hectare, which I have mentioned in the beginning. Truth compels me to say that it is not with the carp that this climax is reached, but with another fish.

I have thought from the beginning that it would be possible to replace the carp by another of our fresh water fish, such as the eel or trout, the prices of which are much higher.

For the culture of the eel special conditions are essential, and the habits of the fish are such as to make its culture in ponds uncertain and undesirable.

On account of its high price the trout has already been made the subject of many experiments, but of all those I have seen undertaken I have not observed a single one which has been a success from a commercial point of view. The reason can be easily stated:

First, the ordinary pond rarely contains water of a temperature during the summer sufficiently low to suit the trout or even to keep it alive, for this fish will not endure a temperature above 18° centigrade; besides, the calm and stagnant water of the pond is not calculated to please it.

It is a fish of rapid streams, of waters incessantly moving and aerated, of the rapid cascades which it ascends joyfully even when they boil like a cauldron;

finally, it is a carnivorous fish, a great feeder, and when at liberty in a water-course it has the habit of migrating if a sufficient supply of food is not present and establishing itself elsewhere. In a pond the trout is a prisoner and it must submit to the conditions imposed upon it, and these do not agree with its independent spirit. When the small fish available for it are exhausted, and they are rapidly exhausted, the young come to a standstill and the fish are reduced to insect food, scarcely sustaining themselves, and do not grow any more.

Add to this the fact that the breeders who have made these attempts and who have favorable conditions for the fish have made a mistake by attempting to cultivate the trout by methods which they apply to the carp. This is a fundamental error; a carnivorous animal will never accommodate itself to the mode of life or conditions which are suitable for herbivorous ones. For all these reasons the rearing of the trout in ponds, though often attempted, has not become current among fish culturists. Still I am convinced that under favorable conditions this rearing will be possible, but it will be necessary to follow a totally different method.

I have in my experiments here been greatly aided by the importation of *Salmonidæ*, which have furnished the means necessary to resolve this problem by having placed in my hands a fish of superior delicacy of flesh and combining all the qualities desirable for pond culture.

In 1879, the Aquarium of the Trocadéro received, through the courtesy of the U. S. Fish Commission and at the request of the National Society of Acclimatization, the eggs of three species of salmon successfully cultivated in America.

I devoted myself ardently to the rearing of these fish with the object of introducing and acclimatizing them in the waters of France. I have rested my hopes

upon two of them, for I have not been misled as to the difficulties inherent in this experiment. But the way being prepared I have not lost sight of pond culture, and as I gradually learned more of the habits and characteristics of these new species I have not been slow to remark that one of them combines the qualities which make it suitable for simple and economic culture, and that by modifying the methods one may secure a new pond fish, the cultivation of which will be infinitely more remunerative than that of the carp.

Without entering more into details I will give the names of the three species of fish.

First: California Salmon.

Its technical name is *Salmo quinnat*, and it is called the California salmon because it is very abundant in the rivers of California. Its form is elongate, its sides silvery white, the back greenish gray or blueish and spotted with numerous brown spots; the head is large, mouth wide, caudal fin deeply forked and pointed at the extremities. It has no red spots on the side like the trout. Its size is large, individuals weighing twenty kilograms having been taken. Its flesh is extremely delicate, of a yellowish apricot color, sometimes deeply pink. It spawns in October.

Second: The Rainbow Trout, *Salmo irideus*.

This is also from California. In general form it resembles the common trout (*Salmo fario*). Its sides are yellowish white, the back brown, marked with elongated spots descending very low on the body; the caudal fin is truncate, but the fish is especially distinguished by a beautiful rose band, which extends along the sides from the opercle to the caudal fin. The opercle itself is strongly tinged with pink. The rainbow trout does not reach the proportions of the California salmon. It does not exceed fifty to sixty centimeters (twenty to twenty-four inches); its flesh is sometimes

white with a tinge of yellow, sometimes pink, according to surroundings, less delicate than that of the California salmon. It spawns in April.

Third: The Brook Trout, or *Salmo fontinalis*.

Its form resembles that of the trout; it is a very pretty fish. Its fins are margined with white, which, with its dark sides, spotted with white, give it a striking resemblance to the *ombre-chevalier*. Like the rainbow trout it does not reach a great size.

These three kinds of fish have been made the subject of many experiments in the Trocadéro Aquarium. I have studied their habits, their characteristics, in order to appreciate their qualities and their advantages, and have endeavored to learn thoroughly their reproduction and rearing.

The qualities which radically distinguish these species from our native Salmonidæ are important.

First, their growth is more rapid. It is possible in ten months to bring them to a weight of three hundred grams. At three years they may measure twenty-eight to thirty-two inches and weigh from thirteen to fifteen pounds. They do not offer any difficulties on account of purity of the water, and accept surroundings to which our trout would not submit. They endure high temperature; they will live in roily water of a temperature of 25° centigrade, while the trout succumbs at 18°. Finally, these salmon, in spite of their name of salmon, are not obliged to go to sea to prepare for their reproduction. They can live and reproduce in fresh water. So, although zöologically they are salmon, from the culinary standpoint they are trout.

It is true that in California *Salmo quinnat* descends the Sacramento, but this journey is not obligatory. In the tanks of the Trocadéro the quinnat reproduces wonderfully, and after five generations its spawning is today as ample as at the beginning.

In studying their qualities I have observed among

these three species certain differences, which caused me to become attached especially to the California salmon. Its flesh is very superior in quality, as has been remarked by certain authors, to that of the rainbow trout, and this is an important thing to be taken into consideration in its acclimatization. In order to make the comparison it is necessary to eat fish of the same age, raised under the same conditions, and at liberty.

It will be seen then that the rainbow trout is far from having the same delicacy as the California salmon. Its flesh is a little hard and dry, resembling that of the white fish, while the quinnat has fine, tender, and creamy flesh like the Scotch trout or the very young salmon.

The California salmon has another advantage over its two congeners—its reproductive period is very advanced. It spawns in the second half of October, while the brook trout spawns in December, and the rainbow not until April. This peculiarity is of the highest importance; it is that upon which is based my preference for the California salmon in the method of culture which we are to explain.

In the enumeration of these qualities there has been less question about the brook trout than the other two species. This is because the fish has not the same adaptability to artificial culture; it is more capricious in its habits; it is oftener subject to inexplicable mortality, and on these accounts I have relegated it to the third place, at least for the present. In that which follows I will confine myself to the California salmon.

In the first place we must ask ourselves the question whether the California salmon is susceptible of culture in ponds. On this subject I have made numerous experiments, which have furnished precise and conclusive results, and which prove that it lives very well in ponds, thriving in them remarkably well.

Without fatiguing you with all these experiments, I will cite two which were undertaken in a small and a large pond.

Dr. Léon Lefort, Vice-President of the Society of Acclimatization of Paris, has raised California salmon and rainbow trout in a pond of a hectare and a half in Sologne. The alevins were furnished by the Trocadéro Aquarium. They were about eight centimeters long when they were placed in this pond of comparatively high temperature. After two years' sojourn in the pond the fish reached an average size of twenty-four inches.

With the assistance of the Fishery Society of Langres (Haute-Marne) I made a rearing experiment in the pond of Leiz, situated near that town. This is a body of water covering two hundred hectares and has no streams flowing into it. We were therefore assured that no predaceous fish would destroy the alevins which we placed there. Under these conditions before the third year the California salmon reached a weight of six to seven kilograms and a length of thirty-one inches, and some of them reproduced.

It is therefore shown by our experiments that the American Salmonidæ live very well in a pond and grow rapidly. Let us inquire before leaving this subject how it is possible to rear these fishes as regularly as carp are raised. In taking carp culture as a type we do not expect the same results, and it is partly by having misunderstood this principle that the attempts made with trout have been unsuccessful.

Fish culture should be a methodical process, producing returns with certainty and regularity. Carp culture has for its object the bringing of this fish to a size advantageous for market purposes, but the carp is not marketable until it reaches a minimum weight of one kilogram, and it finds a better sale when it reaches a weight of two, three, or four kilograms. If we wish

to keep them long enough in a pond to attain this weight and the best perfection possible, we must arrange the ponds in such a way as to secure this as rapidly as possible.

The case is by no means the same either with trout or California salmon. These fish are marketable when they have attained the weight of two hundred grams, and it is to be observed that they bring a better return at this weight than those weighing two, three, four, or more kilograms. As a matter of fact in the Paris market the large trout bring eight francs, while the small ones of two hundred grams are sold at ten francs.

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But a carp weighing two hundred grams is not edible. It is precisely this difference between the California salmon and the carp which serves as a basis for organizing the new method of culture, which I have the honor to explain. We seek merely to obtain small *Salmonidæ*, and this permits us to secure an annual return, a thing which the carp rarely furnishes.

Doubtless this difference in the method of culture will incommode not a little the fish culturist who is in the habit of raising carp. But pond culture of the California salmon as I shall explain it is very simple.

As in all intensive culture this requires care, frequently greater care than with the carp; but we shall see that it yields nearly ten times as much as carp culture.

We will now for greater clearness inquire successively into the different conditions which may present themselves in pond culture.

Suppose, in the first place, a property contains many ponds, some with warm water, others with cold water, a condition of frequent occurrence, how shall these ponds be arranged for use in the culture of the *Salmonidæ*?

The principal prerequisite for a pond culturist

should be to insure abundant nourishment for the fish. In the culture of the carp, which is herbivorous, the ponds must be well supplied with certain species of aquatic plants. I have insisted so strongly upon this point in my recommendations for the last ten years that many proprietors of ponds begin to recognize its value.

At present we seek to raise carnivorous fishes, and all our efforts should lead primarily towards securing an abundant supply of animal food. Certain specialists have believed that they could solve this problem by an unlimited supply of crustaceans; this is the system of Lugin. I have demonstrated in experiments made at the Trocadéro Aquarium that feeding by means of daphnia is simply a dangerous illusion. These little animals possess very small value as food, and fish which are subjected to this regime do not grow. But it is important to the fish culturist that his products grow as quickly as possible, and to accomplish this we must not forsake food materials of rich quality, like meat, blood, etc.

We employ the two series of ponds, of warm water and cold water, for different purposes. The warm ponds in which fish reproduce and grow rapidly, because plants grow in them, are used to raise herbivorous fish of rapid growth, like the carp, tench, and roach.

In this new method of culture the carp and its rearing does not entirely disappear. It is simply relegated to the second place, and cultivated, not for the purpose of obtaining fish of marketable size, but for the fry, which are intended for feeding the Salmonidæ. Carp, roach, and tench, hardy fishes of which the multiplication is unlimited and the growth rapid, will be grown in warm ponds, but produced in such a manner as to remain small, and in order to obtain this result we allow the breeding ponds to be overstocked with eggs, a thing which was avoided carefully under

the old methods, but which on the contrary we seek to attain, because we desire nothing but to produce fry smaller than the carnivorous fish which are to feed upon them.

Besides, the American Salmonidæ, and particularly the California salmon, develop much more rapidly and much earlier than the fry of the Cyprinidæ. In August the young carp measure scarcely four centimetres, and at the same time the California salmon are ten centimetres long at least if they have been properly raised. Thus, the new method of culture is based upon the abundant production of minnows with a view to their transformation into flesh of the Salmonidæ, and in the two series of ponds we conduct two methods of rearing, each of which is equally important. It is clear that each type of pond will be differently managed. The warm ponds should have the banks sloping, should be shallow and well exposed to the sun. The bottom should be furnished with an abundance of plants of suitable height.

The choice of these plants should not be left to chance, but made with judgment, according to the different species of fish which are to inhabit the ponds. As these aquatic plants are not well known to fish culturists, I will mention those which are useful for ponds intended for the cultivation of carp, tench, and roach.

At the end of February or the beginning of March the breeding fish are placed in the pond according to custom, but in double the usual number, in order to insure a surplus production of fry, the securing of a very great quantity of eggs here being the sole object of the operation.

Spawning will take place at the end of May, and the pond will contain a considerable number of alevins, which will be three or four centimetres long, in August. It will be easy to catch them with fine seines and to

transport them quickly to the cold ponds devoted to the rearing of Salmonidæ.

The fish culturist must proportion the number of young of the Cyprinidæ which he will need to the number of Salmonidæ which he desires to feed, and experience will quickly teach him this proportion, which will of course vary with the surrounding conditions and the additional nourishment, more or less, which can be obtained from the worms and insect larvæ in the pond; besides, if there should be a surplus of food for the Salmonidæ he can easily sell it to other fish culturists.

As a general rule, the young carp and tench will be eaten up before they have reached the length of eight centimetres. No advantage is to be derived from allowing them to grow larger. Every year the fish culturist will then secure a new production of fry. There is nothing in this which is either complicated or calculated to embarrass the fish breeder.

Let us proceed now to the arrangement of the cold ponds (I repeat that by cold ponds I mean ponds in which the water is not more than 16° centigrade). Nevertheless, since we have to do here with California salmon, we may consider as cold ponds those in which the temperature rises to 24° centigrade during the heat of summer, that is to say, a truly cold pond of the ordinary kind for Salmonidæ is not a necessity in this method of culture, which has succeeded marvelously in regions provided almost entirely with warm ponds, as at Sologne.

Since a locality always contains some ponds which are cooler than others, I recommend to the fish culturist to give the cooler ones the preference in rearing the California salmon. There are a number of reasons for this which I will not enter into here.

It will be well to arrange beside these ponds one or two moderately large elongate basins, in which the

water can be circulated. These basins are intended for the rearing of the salmon alevins, and in this way time may be saved, because the young increase much more rapidly in them than if they were at liberty in a pond. The rearing basins, dug in the soil, should have a depth of at least half a metre to one and one fifth metres, and the banks should be sloping. A width of a metre and a half will be very practicable. They need not be fully stocked with aquatic plants; a few clumps may be placed in them, which can be arranged in pots buried in the gravelly bottom. The plants which should have the preference are the large-leaved *Potamogetons* and the *Menuphars*; at first they will serve to oxygenate the water and later to furnish shade for the young.

The breeder may have recourse either to eggs or to alevins; the latter are always high priced and difficult to transport. It is, therefore, much more practical to procure the eggs, and, from another point of view, it almost always happens that alevins which are purchased have been injured and have not been properly fed. It is well to know that in this case the inevitable result will be an arrest of development. They will not become large, no matter how favorable the conditions in which they are placed.

Preference should be given to eggs, which involves a slight complication, it is true, because it will be necessary to hatch them; but nothing is easier, and we have today hatching apparatus so simple and practical that hatching is merely a pleasure.

The price of fertilized eggs of California salmon is about eighteen to twenty francs a thousand.

After hatching, the fry are transported to the rearing basin, and at the end of about fifteen days, without waiting for the complete absorption of the yolk sack—I insist especially upon this point—the feeding should be commenced. The food should be suspended daily

in the water by means of a zinc vessel placed about twenty centimetres from the bottom. The general principles of rearing fry should be followed rigorously. In feeding them one should not seek for variations or for imaginary improvements. It should be our aim to grow the alevins rapidly and give them the richest and most easily assimilated food.

For more than ten years I have employed for this purpose the spleen of beef, calf, or horse, the price of which is low and its preparation very simple, because it is given raw and its nutritive properties are very great. This substance has been employed for food of the youngest salmon at the Aquarium of the Trocadéro almost exclusively since 1883, and many fish culturists have followed our example. Blood is also an excellent and cheap food. It should be slightly cooked in hot water. One may ignore all other forms of nourishment, particularly daphnia and the prepared foods which are so extensively advertised.

What number of alevins can be reared per hectare? Experience has shown me that if the conditions are favorable one may raise without danger in a hectare of water, with an average depth of one and one half metres, two hundred kilograms of Salmonidæ at least. If, then, the fish culturist follows my advice by raising California salmon to the weight of two hundred grams, he will place one thousand alevins in a hectare. If he desires to raise fish of a larger size he must use fewer per hectare. Here are, in this respect, the approximate numbers :

1000	salmon of	200	grams	per	hectare.
500	"	400	"	"	"
200	"	1	kilogram	"	"
125	"	1½	"	"	"

These numbers are the results of numerous experiments which I have made upon this point, and I have taken pains to give the minimum, which may often be surpassed under favorable conditions.

At what time should we place the alevins in the pond, and in what time may we expect them to reach marketable size?

The spawning of the California salmon takes place very early, and on account of this precocity it is chosen as the basis for pond culture. With it we are able to complete the culture in one year, a very great advantage which one cannot realize either with the common trout or the rainbow trout, because the former grows very slowly and the latter does not spawn until April. The eggs of the California salmon, deposited at the end of October, hatch in the middle of December. If they are placed at this time in the rearing basin and properly fed, they will measure on an average twelve centimetres by the middle of July, and will then be very suitable for liberating in the pond.

If the temperature of the year has been very high, and the spawning of the carp takes place early, we may doubtless place the salmon in the pond earlier.

By all means the young salmon should be placed in the pond not later than in August. At this time a great many of the Cyprinidæ will be sufficiently developed to answer for their food. The fish culturist then proceeds to seine the alevins with a fine net and to place the salmon in the pond which has been well furnished with its food.

The breeder from this moment should exercise a continual supervision over the pond and assure himself that there is constantly an excess of small fish, for it is essential, in order that the salmon may grow rapidly, that they should find a superabundance of nourishment. Besides, one should be careful not to place too many in the pond at a time and thus cause difficulty.

These young Cyprinidæ do not find favorable conditions for their existence in the salmon pond and will become sickly and furnish indifferent food for the young salmon.

Beginning from the commencement of August, in what time may we hope that the salmon will attain to the weight of two hundred grams? Herein the superiority of the California salmon over other fishes is demonstrated. I do not know any other of which the growth is so rapid when placed under favorable conditions. It does not require more than six months for a young salmon of twelve centimetres, placed in a pond at the end of July, to acquire the weight of half a pound. One may obtain even better results by placing these fish under certain conditions, but this is about the average with current methods. We may, therefore, at the end of January market our salmon.

It will be seen that pond culture by the method which I have indicated can be made to give a very gratifying annual return.

If the breeder desires to obtain larger salmon, instead of catching them at the end of January he should continue the rearing in the same manner, and at the end of the second year he will obtain salmon measuring forty-five to fifty centimetres. I need not add that if one cultivates fish of greater weight than two hundred grams, the number per hectare ought to be reduced in proportion to their size. Upon this subject I refer to a table which I have given above.

As far as my experience permits me to judge, the breeder should limit himself to the average weight of two hundred kilograms per hectare under ordinary conditions. I have reference to a hectare of standing water, for if the pond is traversed by a sufficiently rapid current, such as would be furnished by abundant springs, it is evident that this proportion may be increased. I, therefore, give the amount of two hundred kilograms as a good average, rather low, but it may serve as a rule in the majority of cases. If one exceeds this amount very much, he will experience disastrous results, which should be avoided at all cost.

DISCUSSION ON THE PAPER OF DR. TARLETON H. BEAN.

Mr. Cheney: The reference to daphnia as fish food in Dr. Bean's translation seems to be in direct contradiction to the experience of the late Mr. Thos. Andrews, of England, and of Mr. Chas. G. Atkins in this country, in that Dr. Jousset de Bellesme condemns the little crustacean and Mr. Andrews and other fish breeders highly approve of it as food for fishes. This is explainable, perhaps, when it is understood that the French fish breeder desires to obtain quick results in rearing fish for market, while Mr. Andrews and Mr. Atkins commend the daphnia for very young fish, to be reared for breeding, and not for the table, and I think the daphnia should not be condemned as fish food simply because it is not food on which to rear fish to half a pound weight in a given time, for undoubtedly daphnia constitutes a large portion of the food of our young fishes in wild waters.

Dr. Bean: I ought not to take the floor any further, but I think I may not have made it perfectly clear that I have seen California salmon reared by Dr. Jousset de Bellesme—and I think probably there are others of our members who have seen them too—in the Trocadéro Aquarium, and even as early as July, when our own trout would be at the most three or four inches long, he had fish six inches long, and he raised them in the way he described. It appeared to me that I had never seen handsomer or bigger fish than he had in the Aquarium.

In that little place, where he has only four pools for all his experiments with salmon, he gets sixty thousand eggs of the California salmon every year, hatches them, and raises thirty thousand fry. The whole place is run at an expense of twenty-five hundred dollars a year.

Mr. H. Whitaker: It is a very difficult thing to discuss a paper of the scope of this paper on the spur of the moment, and it must be left for larger consideration until we have had time to read and digest it. There are some things which the writer states that are certainly antagonistic to the views that are commonly held. Not more than a year or two ago, a very skilled physician, Dr. Feurth, of Germany, settled in Detroit. A year or so after he came to Detroit to reside, he came and introduced himself as a gentleman who had been interested in fish culture abroad, and since that time I have found reason to know that he was a practical man in fish culture. I found also that he was familiar with the literature of this country regarding fisheries and fish culture. There was nothing, apparently, that had not been brought to his attention.

There is a remark in this paper that is entirely opposed to what Dr. Feurth told me with regard to the brown trout. His familiarity with the subject was such that I inquired of him what temperature of water they were best calculated to be put into. He assured me and urged me to have some put into our rivers in the extreme southern portion of the state, and he instanced one or two places in Germany where the brown trout had been introduced into water at a temperature of 70° in summer, and he said they thrived beyond all expectation. We have made the experiment this year, and yet the writer of the paper says they will not thrive in warm water. It makes no difference about the exact temperature; the writer intended to intimate that they were not calculated for warm waters, irrespective of exact degree.

Dr. Bean: This paper refers to California salmon.

Mr. H. Whitaker: I am speaking of the brown trout. If the remarks meant anything, it is that they are better adapted to cold than to warm waters. But

this gentleman from Gerinany, who has lived there all his life and is well informed, assured me that the brown trout was doing exceedingly well in waters of 70° in summer; so there is a difference—of course doctors disagree.

There is a very interesting point in connection with this paper—the marvelous statement of this gentleman who says carp are to be despised, because they are so cheap. The price of carp here rivals the price of our better fish in our markets, and in some cases far exceeds it. Let me say a word for the much despised and much disparaged carp. Of all the varieties of foreign fish attempted to be put in American waters, I look upon the carp as one of the most successful and desirable. This may be the rankest heresy, but I tell you it is a fact, and the future is going to show that it will occupy a distinct place in our domestic economy. Its strongest feature will be as a food for the poorer people. I do not know, taking into consideration the prices current as given in the Fishing Gazette, but that it will be too high for the common people, because the wholesale prices reported in the Fishing Gazette, which I have had collated for more than two years, show a wholesale price, I think, a little over six cents a pound, and there are some other men to make a profit out of it still. It is an edible fish. A great mistake regarding carp in this country is that the general belief of the people has been that it is a rare fish, and that it is a rival of the trout or the white fish, or some other desirable fish. Nobody ever introduced it with that idea. I do not believe it, although it is highly esteemed with the food fish of Germany, surrounded by the glamor of the romance of the royal dish for the king; at the same time it is a good fish and must enter into our domestic economy.

One word with regard to the fry. In Michigan we have not attempted to introduce the carp into our Great

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system, and the result was that a year ago last fall a Frenchman was fishing at Point Mouille, on Lake Erie, and he "cot seventy-fiv de barl of carb" and did n't know what it was. To show the importance of that in our locality, I had our statistical agent take two days and go through our markets and make inquiry of the fish dealers as to what value the carp was, what magnitude the sales were, and the sales last year in the Detroit market were seventy tons, which is quite a considerable amount for a fish which introduced itself. Lake system, and have put it into very few rivers. But nature takes care of that thing. The fishermen are robbing our lakes of all the good fish, irrespective of size, and the question is, what is going to become of our waters, and in a measure the carp is solving the question for us. We have a great many applications for fish, as all commissions have. A man wants fish, and will take carp if he cannot get anything else, and some take it out of preference. He builds himself what he calls a pond, and the average farmer thinks he has exerted himself far enough if he throws up a bank of soil that will hold water in the dry season. Fortunately, the freshets of spring and summer time come along, and they wash out his pond as a matter of course. The result is that the connecting stream is stocked with carp, that stream enters into the Lake

But above and beyond all that, he must occupy another position, and in that respect I agree with the writer of the paper. I was talking the matter over with Dr. Bean yesterday. It is going to be the food, or should be the food, of our better varieties of fish, as suggested here. They are prolific and the young are an edible fish, and you simply convert the carp into a better fish, so that you have the carp as a valuable factor there.

There is one more remark I want to make in connection with this paper. You will observe that he

suggests the planting of fish before they lose their sac, which I entirely agree with, and which I have reason to believe is a good thing. For the last two years we have been planting our trout before the sac has been fully absorbed. The result is that you get a good, strong, healthy fish, and when he swims out he is able to take his natural food. To discover when fish begin to feed, we have instituted some experiments in regard to white fish. We have taken them as soon as hatched and put them into receptacles, so arranged as to permit the free ingress of water with the natural food it carries, and we then made examinations under the microscope of the contents of the stomach of these fish. On the third day our commission was engaged, and we did not give the matter attention, but at the end of the fourth day they found that some of the young fish were taking the daphnia and that sort of thing from the water. At the end of the sixth day they found that food in the stomach of every one, and the sac was not yet absorbed. This was with white fish.

Mr. Cheney: How about trout?

Mr. Whitaker: We never tried it with trout.

Mr. Cheney: Would you plant the trout before the sac is absorbed?

Mr. Whitaker: We do, and have done for the last two years. The result is that in taking fish out at that age we have lost almost nothing in transportation. We believe, beyond all doubt, that it is a good thing. There are some other points in connection with the paper that come to mind, but I will not occupy the time of the meeting any further. I think the thanks of the Society are due to Dr. Bean for submitting the translation of this paper to us, and when we have opportunity to look it over we shall be glad to do so.

Mr. Titcomb: One subject that has been referred to by Mr. Whitaker has somewhat shattered my hopes. Up to this year it has been the custom of the fish com-

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mission in our state to plant the fry before the sac was quite absorbed. The result was that we had to plant them before the conditions were right. This year we hatched our fry in spring water. They were all hatched in April, and fed in April, up to the last of April. At that time our streams were full of floods and the snow was not out of them until the first of May, and the result was that we fed our fry a month before planting them, and, in fact, we have not planted them all yet. We have been distributing the last two weeks, and in every instance where we put them out the applicants have been very enthusiastic about the condition in which the fry have been received, and we have greater hopes of the future results of these plans than in cases where we planted previously with the sac nearly absorbed, and before the streams were in proper condition to receive them. I have come to the conclusion that the time to plant them is after the sac is absorbed.

Dr. James: I think this Society ought to feel thankful if an experiment of this kind has been made to succeed, even if it goes a little in opposition to the ordinarily accepted views and experiments of former observers. It seems to me that it is a very long step in the direction of furnishing a better food to the people at a more moderate rate, comparing the amount of actual nutrition which is obtained in the same length of time, say two or three years, so that looking forward from the standpoint which I take in this matter in the way of protecting the fish, in order that a greater amount of value may be obtained from it for the people, I think it is a valuable experiment, and I am glad to see it has so well succeeded.

With regard to the carp, I want to say that the thing Mr. Whitaker spoke of occurred to me some years ago, when I owned a farm with two or three ponds upon it. I obtained the carp from the United

States Fisheries, at their propagating grounds at Washington, and planted them, and on both occasions through the heavy rains, notwithstanding that I took, as I thought, ample precautions, I lost all my carp after they had pretty well grown; and in the large stream right near there, about half a mile below where my ponds were, connected by a stream, two years after that they were finding an abundance of carp, and the boys around the neighborhood were much rejoiced to catch large carp in the main stream. I think some of my neighbors, likewise, lost their fish in the same way; so that I think we were instrumental in quite largely populating the Vancouver stream, on which my farm was located, and in the surplus water of which we undertook to propagate fish, was pretty well filled with the carp.

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INTER-STATE PROTECTION OF FOOD FISHES.

BY DR. BUSHROD W. JAMES—PHILADELPHIA FISH PROTECTIVE
ASSOCIATION.

Some years ago the subject of the United States Government exercising a certain fish protecting control, or at least supervision over the rivers which run through two or more states, and which are frequented by shad, herring, salmon, trout, bass, and other species of food fishes, was presented before this American Fisheries, or Fish Protective Society, by the late United States Fish Commissioner Marshall MacDonald, and it was ably defended by some members of this Society, the United States Fish Commission, I think, generally supporting it; but the majority of opinion outside seemed, at that time, to be unfavorable to the measure.

The proposition was made for the purpose of securing protection to the fish along the coast and also when they are in the act of passing across the state lines in order to enter their spawning grounds in the upper rivers and their tributaries. Each part of the discussion was clearly in favor either of United States supervision or of state supremacy, but decisions by the Supreme Court of the United States have been made that the measure would be unconstitutional, so that each state maintains its exclusive right over its fishing streams, except in a few instances, such as the states of

Pennsylvania, New York, and New Jersey, where these states have entered into an inter-state protective agreement, which still remains imperfect, however, until Delaware joins in the compact. This agreement specially relates to the shad, which, running up on our eastern coast, and into their habitat rivers and streams, attain the perfection of flavor and superiority of quality in the waters of the Delaware River. For many miles the four states herein mentioned have exclusive rights to this desirable fish, and it having been proven that non-protection would finally result in extermination, the wisdom of inter-state legislation was acknowledged and joint-protection laws adopted. Delaware doubtless holds the law under protracted consideration because of the vast numbers of fish that have annually fallen into her nets, but when she becomes satisfied that the proposed legislation will actually produce better effects for the fisheries of her own domain, as well as that of her sister states, she will, I have no doubt, accept the proposed legislation without further demur.

It stands to reason that if a co-operative law guards the fish during the spawning season, the number will increase in surprising ratio.

Another thing to be considered is the unpalatableness of fishes that are hurrying into shallow waters in order to deposit their ova. The flesh is soft and somewhat flavorless, and of late years particularly the roe alone of spawning shad is regarded as valuable. In some of our markets the body of the fish can be purchased for a small sum in comparison to the price paid for the crisp, bright flesh of the male, while the roes bring fancy prices according to the wealth of the purchasers.

I must confess to an idea that a single debate is not sufficient in such a matter, but that we should urge it from time to time, until all the individual states thus

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interested arrive at some suitable inter-state legislation, that will produce lasting benefit to all concerned.

We would refer in this connection to the acknowledged benefit accruing from the fish hatcheries that have deposited several varieties of young fish in the upper streams of many of our important rivers. If artificially hatched fry produce such commendable results, is it not easy to understand how protection of the breeding fishes and their young must necessarily amount to still greater good, because of the very much larger number that would be produced through the natural course of fish spawning, increased production meaning increased revenue?

We must consider that it is the bounden duty of the states to provide in every possible honorable manner for the increase of every industry within the limits of their jurisdiction, and that the supplying of food fish is and always has been a very prominent industry in our coast and lake bordering states particularly. We have had it demonstrated to our perfect conviction that indiscriminate fishing with the numerous devices of modern invention has very nearly ruined the food fishing interests in certain waters, and that whole towns and bays have been nearly impoverished by the lack of supply for home consumption, as well as for trade.

We have also had very satisfactory demonstration of the astonishing benefit already derived by the protective systems recently adopted by several states, especially in reference to the Delaware River. Therefore, we cannot but express the firm conviction that the governments of the respective states should act in such a manner as to make mutual state laws to suit the various localities, not taking the laws of Pennsylvania, New York, and New Jersey as the text, but let the legislation for each part of the country be consistent with the requisites of each. New York and Pennsylvania may well be satisfied with the outcome of their legis-

lation thus far, and the example of each might well serve as a beacon for all other states. But year after year passes and border waters still remain unguarded to a very great extent.

Maryland is now making efforts through her State Fish Protective Association and her commissioners to join with Pennsylvania in protecting the Susquehanna and its great tributary branches. They have already succeeded in exterminating all authorized means for fishing in this great river which runs through Maryland territory, where the objectionable pounds and wiers once almost depopulated the upper waters of this valuable fish, the shad, just as it was aiming to reach the breeding places along the upper branches of the Susquehanna.

The Potomac is yet but partially guarded. Maryland has passed a law, which applies to the Potomac and its tributary rivers, forbidding fishing from April 15th to June 1st, but it has thus far only received the co-operation of Virginia, and the law cannot be properly enforced until West Virginia laws concur in the project. Thus two inter-state laws are held somewhat inoperative, each because of the non-concurrence of one single state for each in a compact which would in reality receive equal advantage if they would but study the matter with unbiased consideration. Delaware evidently holds back because she has the opportunity of access to the large schools of fish as they turn with unwavering instinct toward the calm, pure, shallow waters of the upper Delaware River and its communicating streams in Southern New York and Northern Pennsylvania. But can the state of Delaware claim the same commercial value for the fish as she takes them, and the same fish as taken in the upper stream under the protective laws of the three adjoining states? I think prices will and must speak; and this very season we have some proof. Before the legalized sea-

son in Pennsylvania it was possible to buy large roe shad for from twenty-five to thirty-five cents, while the males sold for much less. Some of the fish were quite satisfactory, but most were soft, devoid of their usual rich flavor, and objectionable, though undoubtedly fresh. Then came a week or two when right fresh shad could not be had in any quantity, and then came the "real fine Delaware shad," no larger than the former, but possessing the true, rich flavor peculiar to the perfect up-river fish with its firm white flesh, and these were entirely unattainable in the market at retail under forty-five or fifty cents for the smaller, while the choice specimens ran up to a higher price. Now, if the more southern states were content to legislate with the northern, and permit the spawning fish to ascend the streams unmolested on certain days of each week, the shad season would not begin so early in the year, but the catch would be more valuable in the end. We think it would be wise to teach those who are interested in the fisheries that when a roe shad is large and flabby and the eggs quite large and distinct from one another, that the flesh thereof is really quite unfit for good food, and that in selfishly taking the roe, the increase of the number of fishes by spawning for the next season is lessened by many thousands, for each large roe fish that is caught and eaten diminishes the spawn supply accordingly, when indiscriminate fishing is permitted. Another thing that is to be taught is that all roe fishes that ascend with the schools in the running season do not deposit eggs, and therefore it does not preclude the possibility of obtaining the desirable dainty fish to wait until the spawning fishes have gone to their haunts. When these questions are fully understood, Delaware and West Virginia, as well as all the other states, will doubtless see the plausibility, in fact, the necessity for this inter-state legislation.

But while states in juxtaposition may be prevailed



upon to pass joint laws, it cannot be looked upon as a certainty that they will always maintain them, when it is found that the interests of one state comes into apparent opposition to those of its neighbors which border on the same waters. Hence, is seen the proof of the positive requirement of good conjoint laws. They must not be too restrictive upon one territory, not be too lenient with another, and yet they must be of such a nature as to be the means of adding many hundreds of thousands of dollars of increased revenue, to each state interested, to the already present value of the food fish industry.

Another view to take of this very important subject is the probability that when the people of these states are more enlightened upon the subject, and take the matter into practical consideration, each state will be willing to co-operate, knowing that self-interest alone cannot make the best laws for all. This subject must naturally arouse some doubt in the minds of legislators of neighboring states, when each state is allowed to legislate only in its own way upon that which is truly a mutual affair.

The dissatisfaction that will surely exhibit itself in making inter-state laws, at first, will soon melt away before the proofs of the success of such agreements.

The increased number and value of the food fishes which have been hatched in the different authorized fish hatcheries through the country, the fry from which have been deposited in rivers in many parts of different states, show the value of the plan too plainly to ever allow it to fall into disuse, but when the spawning fish are so protected that they also will produce more largely, the industry will once more become peculiarly lucrative, not only to individuals, but to states and the country.

Wealth always begets wealth if properly directed, and our state governments are not so rich as to be

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indifferent to augmenting their revenues. Therefore, let us still keep it before the eyes of the proper authorities that state legislation positively requires conjoint laws to improve the present situation.

DISCUSSION ON THE PAPER OF DR. JAMES.

Mr. Amsden: Any remarks on this paper just read by the gentleman from Pennsylvania must call to mind one thing. There is almost due, if not past due, a report from the joint commission appointed by the United States and Great Britain, of which Mr. Rathbourne was one, which commission was to look up this subject of the depletion of the Great Lakes, the cause, and make such recommendations for the future as were deemed wise. I have been looking many months for that report. I think it is now in the hands of the printer. That covers the same ground as the paper just read—this interesting matter of protection. I do not believe that we will ever get any national legislation on this fish question, on account of the jealousy between the states and the state right question. It seems to me that this Association might be of great service in that direction, and do something more than meet once a year, and the thought occurred to me while the paper was being read why this Association could not authorize its President during the next year to take this subject up and go before the Legislatures of the states that stand out, like Delaware and West Virginia, and let him appear before them, and in argument bring them around in line with the other states. The same condition exists on the Great Lakes. There the states do not act in unison, and never have. Then the question of jurisdiction comes up that the states cannot act to form any treaty act between themselves

and the Dominion of Canada; it is only the United States that can join in any treaty, so that it makes it a difficult question to solve. That thought occurred to me, why this Society cannot be of some benefit in bringing about joint state action, not only on the rivers, but the Great Lakes.

Mr. Mather: The suggestion that Mr. Amsden makes, that the President of this Association do that, is a good one; but just exactly how the President of the Association shall do it, or where his funds are going to come from, I do not understand.

Mr. H. Whitaker: His expenses to be paid from his salary as President.

Mr. Mather: This Association certainly cannot bear the expense of it, unless the President does it out of his salary as President. (Laughter.)

Mr. Dickerson: I do not believe it is practicable to change the Constitutions of the several states so that the laws could be uniform, as suggested. I think that would be impossible to bring about. It occurs to me that the only way to do it is to go a little further than the gentleman has suggested, and that is, appoint a committee—I speak now of the lakes bordering on fresh water, the salt water lakes we have nothing to do with—but we need a uniform law for the protection of game and fish in all states bordering on fresh water lakes, and it seems to me the only way to do that is to appoint a committee of three or five, which shall draft a bill, which shall be uniform in all states bordering on the Great Lakes, and then let the fish commissioners of the various states see that the bill is introduced, and if possible put through their Legislature. In our Legislature last year, if there was one, there were a dozen or more members said to me, "When you can get Ohio, New York, and Pennsylvania to join in a bill that shall be the same as ours, that shall be uniform on all the Great Lakes, then we shall unite in

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anything the Commission of Michigan may suggest." I also have assurances from the authorities in Canada that in any bill we may agree upon they will meet us half way; and it seems to me that the only feasible way to do this is to appoint a committee to draft a bill, and have it uniform in all states, and put it through the various state Legislatures to which they belong.

Mr. H. Whitaker: The suggestion contained in the paper of Dr. James is a very familiar one. There is no doubt that it does not lie in the authority of the United States to enforce any law to preserve the fisheries interest. The thing has been re-affirmed by the United States Courts, and no later than sixty days ago, that the police power of regulating these things lies in the state authorities. We have got to forsake this idea of appealing to the General Government for a redress of our grievances. When we attempt it we admit the weakness of the state to enforce its police regulation. The states have power, they do not lack power, but the difficulty in their way is the same that the United States would have to confront if they sought to have a law established, if it were possible, and that is the invested interest of money and means in the fisheries. The United States do not begin to be as able to cope with that sort of a question as the men who reside in the different states.

The thing that will bring about better results than anything else is a conference between the states interested in the matter and an agreement upon a uniform law to be passed, and for each state not only to bind itself that it will submit such a law to its Legislature, but that it will insist on its passage and enforcement. There is no question in the world that the fisheries of the Great Lake System, with which I am more familiar than any other, are bound to be exterminated within the course of a very few years. I was called up on the telephone by a wholesale fish dealer, from his house in

Detroit, within the last month. I asked him what he wanted. He said, "Come down here, I want to show you a barrel of fish. It is a d—— shame. We have fish here of your planting, and a dozen of them will not give a half-pound."

Mr. Amsden: Where were those fish taken?

Mr. Whitaker: At Grand Haven. They would not average a half-pound to each white fish. There were from two thousand to twenty-five hundred white fish in a barrel. There were some heavy (?), and if not heavy (?) were too small to be caught. I told the dealer I would like to have his bill and letter. He said I could have them both, and he gave them to me. Unfortunately, in our state, the administration of the fishery laws does not reside in the commission, but is given to a separate bureau. Fortunately, however, we have an active and efficient wardman there just now, and after bringing this matter to his attention, and in view of the fact that we have had eight years of wardmanship there, and there had never been an enforcement of the fisheries laws, he has taken steps to have this matter investigated. The man said, in his letter, that he could furnish a thousand pounds of fish a day of this kind, and as two dealers were supplying them there was sixty to seventy thousand pounds of white fish a month, not within two years of the spawning age.

Mr. Amsden: What is the violation of law for which the nets may be taken up?

Mr. Whitaker: The only law we have in Michigan waters protecting white fish is a regulation we had passed eight years ago regulating the size of the mesh. We have nothing regulating the size of the fish.

Mr. Amsden: What were the sizes of the nets?

Mr. Whitaker: The nets were seized because the lowest size we permit is two and one half inch mesh, and these were two and one fourth inches. As soon as

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these men were arrested, the Associated Press dispatches said there was to be a riot in the city. The business of these men was being ruined. What was their business? To violate the law. The dispatches said their business was being ruined and hundreds of families thrown out of means of support. Within forty-eight hours from that time—they did not have any riot, but the men were arrested all right—the nets were seized, not confiscated. Within forty-eight hours I received a communication from the committing magistrate and every Democrat and Republican of prominence in the locality, thinking they would have some influence with the Board, asking us to give these men permission to fish with their nets until the end of the year, and they would be good and not violate the law again, and would inform on their neighbors. I knew that we had no authority to grant this request, and with a knowledge of the history of the thing, as we understood it, we would not have granted it if we had. I called the Board together by telegraph, so that these men might not say that their petition had not received careful attention. We informed them that there was no provision in the statute in the State of Michigan that we knew of giving the fish commission power to waive the force and effect of the statute. Their next application was to the game warden for the same thing. After consultation with us, he gave them the same answer. On Friday of that week the Governor of the state happened to be in town, and I was informed that the fishermen went to him with their friends to make a personal application to the Governor. The Governor asked Mr. Dickerson and myself, who are the resident members, to come in and consult with him, and we did so. The Governor has a backbone like a crowbar. He treated the matter with civility and heard these men, and in their petition to us that they stated that they were not to blame for those

imaginary Associated Press dispatches, and that the American Net and Twine Company representative induced them to have nets made of that size, and that they were not to blame. In the meeting at the Russell House, where the Governor was present, these men openly and frankly admitted that they did order these nets of the size they were fishing with, and the representative of another net and twine company said that he had informed some of those identical men that they were fishing with nets whose meshes were of an illegal size.

That is the sort of thing we have to run up against in Michigan, and I say to you that Grand Haven is not a single instance. They are doing it all over the state, and the returns we get from our statistical agent last year show that nearly two thirds of the fish caught in Michigan waters are No. 2, which never get to a spawning age.

It will be remembered that a year ago I suggested that authority be given to have a meeting called of the representatives of the Lake States, and it ought to be enlarged to take in all other states, because a question of uniformity in one direction is just as important in another. I think that meeting would have been called last year, but there are several Lake States which have biennial sessions of the Legislature, and which do not meet until the first of January, 1897. If it is possible to do so, a meeting of that kind will undoubtedly be called somewhere on the Great Lake system for consultation this fall, and see if we cannot come to some agreement that will, at least on the Great Lakes, give us a uniform law. We cannot admit the weakness of the state in this thing, because the state must be able to enforce its laws in one direction equally as well as the other. You have got to meet invested capital every time, and it is a hard thing to fight. It is not the disposition of a single fish commission to injure a

man's business, but his business may not come within the law; and moreover, the act that the fisherman exercises is a privilege and not a right. The fisheries are the fisheries of the people, and whatever tends to injure the interest of the people in these fisheries, and which may lead to their extermination, must be resisted by the American Fisheries Society. The statistical agent of our state told me he went into a fish dealer's house on Mackinaw Island, and kicked open a keg of white fish, which contained fish of a size to require eight to make a pound, two ounces apiece. What do you think of that? Murder in the first degree. These fishermen are standing in their own light when they do anything like that. The fish which the dealer brought to my attention in Detroit, he said he got a half-cent a pound for. I asked him how much he would get if they were left in the water for two years, and he said six cents a pound. There is the thing in a nutshell. The people are expecting too much when they expect the fisheries are going to be renewed or sustained when you permit the parent fish to be taken out, and not only that, but you take the little fellows out before they have come near having the disposition or ability to spawn; and these things are matters which it is in the province of this Society to take cognizance of and correct.

Mr. Douredoure: Can you form some idea of what it cost to put this fish in the water—how much per pound?

Mr. Whitaker: I cannot tell you what it cost per pound. I can tell you what it cost the state of Michigan for the two years that we figured up, two years ago. Our total cost of fry put in was something like twelve cents and a half per thousand. In two localities on the Great Lakes, at least, we have the statements of the fishermen that they are catching our fish. The dealer told me the other fish were not ours.

Those were in Lake Erie. There are certain characteristics of the Lake Erie fish which cause them to differ from Lake Michigan fish. They have a hump on their back, and can easily be told by a Lake Michigan fisherman. In the Detroit River a great number of fish have been put in the past year. The report shows that in the west end of Lake Erie they had better white fish last fall than for a number of years, and it only shows that they are beginning to feel the effects of the restrictions which we have placed upon the fishing.

Mr. Amsden: It seems to me if there is any one subject the Society can take up and discuss with great benefit to the country at large it is this, and for the Society to meet once a year and publish its transactions, with a limited circulation, does not accomplish what it should accomplish. We complain because our membership is not larger and more interest is not taken in the Society. I think if we took hold of a subject like this and acted on it forcibly, we would enlarge the membership of our Society and accomplish something. To my mind, the food fish is of very much more importance than the game fish, and as to the expense of doing this, which Mr. Mather questions, I am willing to pay a good deal larger dues, if necessary, so that it can be done. These transactions that we publish do not reach the quarters we desire them to reach, and it seems to me that when the Legislatures meet it would not be very expensive for our President and one or two of our members to go right there before the committees and argue the matter and convince them of these facts. It is the only way that I see in which you can do it.

Mr. Gunckel: A word with reference to Western Ohio, as to these small fish. Ohio is in the position which has been stated here. They will say, we cannot do anything either, unless Michigan and Pennsylv-

vania will jointly do something. I was personally acquainted with some of the leading fish commissioners. When Major McKinley was Governor he came to Toledo and sent for me, and asked me whether I would go on the fish commission. I told him no, I would not. I will tell you why. The Ohio Legislature does not recognize the five fish commissioners. Last summer they appointed a committee to go to Toledo, to go to Vermilion, to go to Port Clinton and Sandusky, to examine the fisheries. They ignored the fish commission, they ignored men who are connected with the American Fisheries Society in the position I am for the protection of fish, and they went to these places and were banqueted by these commercial men who are interested financially in the subject—the committee was banqueted and taken care of and not permitted to see any one that represented a class of men whose interests in the fisheries were on a higher plane than financial considerations—and this class of men is backed by all the newspapers of the city of Toledo, and the committee went home and arranged matters to suit the commercial interests. Congressman Southard, from our district, has brought the matter up again, and says he is in communication with Governor Bushnell, and has his approval; and we want to follow this thing up closely, and we want to know whether a reorganization of the fish commission of Ohio will not do something. I have been corresponding with Mr. Southard, and told him that the Legislature should recognize the commission, or else throw the commission out and begin anew.

The resolution that was passed here a little while ago appointing a member of this Society from each state to take an interest in this thing and see that the fish commissioners are recognized, if I remember correctly, I think would do a great deal of good. The last two or three months I have taken a personal inter-

est in the American Fisheries Society. I have all the papers in Toledo back of this Society, and I think we are a little bit slow in waiting one year before pushing this thing. Let us begin now and start the thing where it belongs and will do the most good. I may be wrong, but these are things I observe from the outside, and I know I can bring the entire press of Northwestern Ohio in favor of anything that this Society may recommend. I am a member of the Press Club in Toledo, and I come with authority from them that they stand ready to aid you all in their power. I met the editor of the Commercial just before I left, and he said to me, "Mr. Gunckel, this paper stands ready at any time to back up the American Fisheries Society in their efforts for the protection of fish."

My attention was called some time ago to several barrels of fish from Toledo, of pickerel, perch, and white fish, that they had to take back and dump into the bay for want of a market. They were too small to sell. The papers all had accounts shortly after that the shores were covered with dead fish, and it was this fish that had been dumped in the bay, because it was too small to sell in the market. Is the American Fisheries Society going to permit anything like that? Are not they smart enough to get around this business, and get hold of the thing, check it? I have been stirred up very much over this subject, at times, and we should make a stand and prosecute this work. You have the good will of Major McKinley, the good will and backing of Governor Bushnell, and with such men as Mr. Whitaker in Michigan, I don't see why we cannot push things and make it go.

Mr. H. Whitaker: I want to say a word right in line with the paper read by Dr. James, and that is on the question of government control. The greatest mistake that Ohio ever made in this world was when she relinquished her interest in the propagation of fish

to others. She lost caste and standing in her own state, and I tell you nobody can watch the interests of a state so well as her own citizens. (Applause.) We came near falling into the same trap in Michigan, but we saw it in time to avert the disaster. The proposition plainly was this—let us take possession of your fisheries and we will take sixty per cent. and give you forty per cent. Why should not the state of Michigan have the hundred per cent.? It is a good deal like the arrangement of the planter with the negro. He said to the darkey, "I will give you so much land to work, I will furnish you the seed, and you shall do the work and have one third of the crop." In the fall the darkey came around and said, "I come to see you now about settling up." "What do you mean, you black cuss?" "The cotton crop is in, massa, and I thought I would come and settle up." "What do you mean?" "You know, massa, I was to get one third of the crop." "Why," he says, "You black rascal, we did n't raise but two thirds of a crop; your third was n't raised." (Laughter.) That is about the way the thing sums itself up.

CONCERNING THE WORK OF THE FISHERIES, GAME, AND FOREST COMMISSION OF THE STATE OF NEW YORK.

BY A. N. CHENEY, STATE FISH CULTURIST.

So far as the Fisheries, Game, and Forest Commission of New York is concerned, the request of Dr. Bean, Recording Secretary of this Society, for a report showing results of work accomplished during the past year, may be summarized as follows:

Applications were received from the people of the state for planting in public waters, for brook trout, 10,864,200; brown trout, 1,380,600; rainbow trout, 155,500; lake trout, 6,110,000; pike perch, 13,143,000; black bass, 1,136,075; white fish, 30,000,000; ciscoes, 34,000,000; frost fish, 2,000,000; total, 98,789,375.

To fill their applications, the state hatched and had for the spring distribution fry as follows: Brook trout, 4,315,000; brown trout, 900,000; rainbow trout, 100,000; lake trout, 3,255,000; frost fish, 10,000,000; ciscoes, 32,000,000; white fish, 11,750,000; total, 62,320,000.

In addition, 265,000 brook trout, 81,000 brown trout, 57,000 lake trout, 10,000 rainbow trout, 15,000 landlocked salmon, 3,000 sea trout from Europe, or a total of 431,000 fry, were retained at the hatchery stations to be reared to eight and twelve months of age before planting in wild waters.

The work of hatching and planting the spring spawning fishes is not yet completed, but it will be observed that of the various species of trout 18,510,000 fry were asked for, and only 8,560,000 were on hand to fill the applications. There was a shortage of 18,250,000 white fish, 2,000,000 of ciscoes, and a surplus of 8,000,000 of frost fish, which is the round white fish found in Adirondack waters. Among the fish not enumerated, 76,000,000 of tom cods and 35,000,000 smelts were hatched and planted in Long Island waters; 50,000 eggs of the Atlantic salmon were received from the United States Fish Commission, and the fry hatched and planted in the head waters of the Hudson River, and 302,000 lobsters in Long Island waters. 100,000 eggs of the steelhead trout were also received from the United States Fish Commission, and hatched at the Caledonia and Cold Spring Harbor stations.

It is the policy of the commission to give its attention chiefly to what are termed commercial fishes, and in furtherance of this policy 90,000,000 pike perch were hatched and planted as against 41,205,000 in 1895.

This work of hatching commercial fishes has its limits, however, like all other fish cultural work, and the boundary point is the number of eggs that can be obtained.

It is the policy of the commission also to rear as many of the salmon family to eight and twelve months of age before planting, as the facilities of the stations will permit. Heretofore these facilities have been very limited indeed, and in 1895 but 12,750 fingerlings of eight months, and yearlings of twelve months (I say yearlings of twelve months, for fingerlings of eight months are frequently called "yearlings" by courtesy), including brook, brown, rainbow trout, and landlocked salmon, were distributed from the state hatcheries, and none were reared or planted previous to the organ-

ization of this commission. As I have already shown, 431,000 are now being reared, and arrangements have been made for building rearing ponds and boxes so that the output will be 1,000,000 in the nearby future.

The experiment was made during the spring of changing trout fry and eggs from the water and food of one hatchery to that of another, much as members of the human family are moved from mountain to sea air, or vice versa, as a tonic, and the result, whether owing to the change alone or from other causes, has been the strongest, most vigorous fry turned out in years by the state, if the testimony of the hatchery men and the people who have received the fry is competent. Not a single complaint has been received that the fry were sick or weak or in poor condition.

Yearling trout have been reared the past year that were nine inches long. I moved one lot of yearling trout, receiving them from a hatchery messenger after a journey of two hundred miles, and taking them seventy-five miles further without the loss of a fish, and there was scarcely one that was under the legal length of six inches. By legal length I mean the length exceeding which trout may be killed by statute when caught. The planting of trout over six inches in length will tend to render the efforts of the commission void in stocking streams to make them self-sustaining, as every one of such fish planted in the spring may be legally caught and killed before they have an opportunity to spawn. It is for that and other reasons allied to it that the commissioners sought to obtain the power possessed by the New Hampshire Commission, and perhaps other state fish commissions, to enable them to close planted streams until the fish become established, or until they have had the opportunity to spawn at least once before they can be legally killed. As the law now stands it presents the curious anomaly of practically nullifying the efforts of the commission

to make the planted waters in a measure, at least, self-sustaining, and so far the Legislature has not seen fit to grant to the commission the power it seeks to close such waters for a time.

The great number of applications for fish of various kinds are carefully examined by the commission, and those for private waters are thrown out. If applicants describe waters that are unsuitable for the fish asked for, their applications are also thrown out or filled with fish suitable for the water in question. The commission has issued a circular, a copy of which is sent to each person applying for fish, describing the proper way to handle and care for fry until they are deposited.

At the time the table from which I have quoted, showing the number of fish applied for, was made up, 1,136,075 black bass were asked for. This is a fish, as every one here knows, that is not yet hatched artificially, and the state can supply them only by netting waters in one part of the state to supply waters in another, or by purchase from waters without the state. Last year with an expenditure of \$500 the commission purchased and caught for distribution 1,810 adult black bass, and 18,300 fingerlings about two inches long, a greater number than ever before distributed by the state in one year. The law of the state opens the black bass fishing on May 30; and as black bass spawn all through the month of June and the brood of young bass require the care of the parent fish for some time after they are hatched, it seems like wasting at the bung and filling at the spigot to expect the commission to keep up the supply of black bass with the few that they can buy. In fact, I have suggested to the commissioners, informally, that until the close time is changed to cover the breeding season it might be wise to distribute no black bass whatever, for no commission can perform the impossible, and 18,000

two-inch bass—less than one five-pound bass would rear if all eggs and fry survived—will go but a very little way toward supplying the waste of a whole month of fishing during the breeding season.

Another law that the commission has to contend with to keep up the supply of one of the most important of food fishes is the shad law. Before the construction of the Erie Canal in 1825, which necessitated building a dam across the Hudson River at Troy, shad ran up the Hudson to Bakers Falls at Sandy Hill, fifty miles above Troy, and furnished food to a community to which shad is now a comparative rarity. In that day many a farmer came to the river below Bakers Falls and camped until he had secured and salted down a supply of shad for the winter. The Troy dam checked the upward migration of the shad from the time it was built until this day, but good catches of shad were made just below the dam up to within, say, ten or fifteen years ago. Within a few days just passed I have questioned the net fishermen who have applied to the commission for license to net the river at or near Albany for herring, and they tell me it would not pay them to set a net for shad. The present shad law relating to the Hudson provides an open season between March 14 and June 15 for netting shad, "but said nets shall not be drawn nor fish taken therefrom between sunset on Saturday night and sunrise on Monday morning, unless by reason of the inclemency of the weather said nets cannot be drawn prior to sunset on Saturday night, in which case it shall be lawful to take fish therefrom as soon as the weather will permit." With this law in force the commission has been unable to secure a sufficient number of ripe shad at Catskill to keep up the supply of this species of fish in the river without assistance from the United States Fish Commission. It was thought advisable by the commission to amend this section of the law at the ses-

sion of the Legislature during the past winter, and a bill was introduced which required that shad nets be taken up at sunset Friday night and not fished until sunrise Monday, and it also provided that nets should not be operated by boats propelled by steam. This amendment was for the purpose of opening the river a reasonable time each week to enable a sufficient number of breeding shad to reach their spawning grounds and keep up the stock, in case aid from outside sources should fail. The steamboat clause was for the purpose of putting all the fishermen on the same footing. This bill passed the Senate, but was defeated in the Assembly.

In 1895 unusual efforts were made by this commission to obtain shad eggs in the Hudson, and 3,087,000 fry were hatched and planted, and 4,900,000 contributed to the Hudson by the United States Fish Commission. From 1883 to 1895, both years inclusive, the state planted in the Hudson 33,522,500 shad fry, and during the same period the United States Fish Commission contributed to the Hudson 54,511,000 shad fry from other rivers, or 20,988,500 more than the state was able to supply from the river itself. With these figures, taken from the reports of this commission and furnished to me by Commissioner Brice from the books of the United States Fish Commission, as a basis, one can imagine what the condition of the shad fishing in the Hudson would have become had it not been for contributions of fry from the Delaware and Susquehanna Rivers. This year the shad work of this commission is not completed, but the United States Fish Commission has already contributed to the Hudson 3,000,000 shad fry from the Susquehanna and 2,000,000 from the Delaware.

Contributions of shad fry from other rivers doubtless do more than aid to keep up the supply of fish in the Hudson, as the fresh blood must invigorate and improve the stock.

Since 1882 the greatest number of shad fry the state has been able to plant in the river from eggs obtained from the shad of the river was in 1889, when 6,000,000 were planted. The next best seasons were 1887, 1888, and 1895, when something over 3,000,000 were planted each year. In 1891 the United States contributed 9,348,000 fry, and six other years from 4,200,000 up to 7,414,000 annually.

As to the importance of the shad fisheries of the Hudson and the value of the product, the commission caused an investigation to be made last year covering all the fishing stations from Sandy Hook to Castleton, nine miles below Albany. It was found that 3,471 nets were operated and 1,155,610 shad were taken during the season of 1895. New Jersey is credited with 1,666 nets, operated at eleven stations, and taking 417,829 shad. New York is credited with 1,805 nets, operated at sixty-seven stations, and taking 737,781 fish. The greatest number of nets at a single station is 703, at Alpine, N. J., taking 94,100 shad. Fort Lee, N. J., operates 337 nets, taking 114,300 shad. The greatest number of nets operated from New York stations was 306 at Sing Sing, taking 16,400 shad, and 313 at Nyack, taking 3,853. The nets gradually peter out up stream, until Castleton, with one net, is credited with 500 shad. At Catskill, where the work of this commission is carried on, six nets were operated, taking 5,000 shad.

To get at the weight and value of the shad catch in the Hudson, I asked Ex-Commissioner Blackford to give the average figures of fish received at Fulton Market. He wrote me:

"Regarding the Hudson River shad, I would say that 100 buck shad will weigh 308 pounds, and 100 roe shad will weigh 412 pounds. This, you see, will make their average a little over three and one half pounds. The proportion of bucks to roe shad this season has

been sixty per cent. roe shad to forty per cent. buck shad. The average price for the entire season has been twenty cents for roe shad and ten cents for buck shad. The lowest price they have sold for on any one day was ten cents for roe shad and five cents for bucks. For quality and size, the Hudson River shad has been good—rather better than for the last two or three years."

With these figures as a basis, I find that the catch of shad in the Hudson River in 1895 weighed 4,044,635 pounds, and that 693,366 roe shad brought \$138,673.20, and 462,244 buck shad brought \$46,224.40, or a total for the entire catch of \$184,897.60.

The mascalonge work at Chautauqua Lake is in progress at this time, and probably 3,000,000 fry of this species will be planted by the state. The mascalonge of Chautauqua Lake, while structurally like the St. Lawrence River fish, is differently marked, and wholly lacks the round brown spots of the latter. The Chautauqua fish is blotched or banded on the sides with rich brown on a light ground. I believe that no other commission has attempted to cultivate the mascalonge artificially. A number of experiments were made in this work before the hatching of mascalonge was successful. The eggs were tried in the hatching jar and in shad boxes in running water, but finally the eggs were placed in boxes with double screens top and bottom to prevent the eggs being eaten by minnows and other fish, and the boxes were sunk in the lake in still water.

It is difficult to obtain all the eggs from a fish at one handling, but 265,000 eggs have been taken at one time from a female of thirty-two pounds. Only one maskallonge was killed last year of all that were handled. After milting the eggs separate in three quarters of an hour, and about ninety-seven per cent. of impregnated eggs are hatched. With water at 55° Fahrenheit the fry hatch in about fifteen days, and it requires

about the same length of time to absorb the umbilical sac. The fry of the mascalonge when first hatched are very helpless, and apparently a prey to every living thing.

This commission is giving considerable thought to the question of providing food for fishes in wild waters, as it believes that many failures to stock lakes and streams are directly chargeable to a lack of proper food for the planted fish. This subject is treated at some length in the annual report of the commission now in the hands of the printer. The steelhead trout mentioned in this paper are the first to be brought to New York, and they will be planted in one of the large lakes in Northern New York and in Long Island streams flowing into the sea. The Scotch sea trout are the first to be brought to this country and will not be distributed at present.

The total output of fish, of all kinds, will be considerably larger this year, when all the work is finished, than last year, when under the old Fishery Commission and the new Fisheries, Game, and Forest Commission combined a grand total of 196,247,840 were planted.

WASTE OF FOOD FISHES.

BY L. D. HUNTINGTON, EX-PRESIDENT OF THE NEW YORK
FISH COMMISSION.

The yearly waste of food fish along our coast is a subject deserving the consideration of all interested in the supply of healthful food. The subject should especially receive the careful attention of the citizens of the seaboard states. The waste from the indiscriminate use of the purse net by the menhaden fishermen, along our coast from Maine to North Carolina, demands proper attention and careful consideration. This industry, the products of which are guano and oil (from fish), is one of considerable importance; it is organized under the title of the "United States Menhaden Oil and Guano Association," with a capital of about two million dollars, employing from two thousand to twenty-five hundred men, with annual products of about five or six hundred thousand dollars in guano, and about four hundred thousand dollars in oil, the capital, number of men employed, and value of products varying somewhat yearly; this enterprise should receive proper consideration as a business venture, but not be allowed to trespass upon the rights and privileges of the citizens of the seaboard states, by wasting the food products of the waters of the coast by converting them into guano. In the prosecution of their business (catching menhaden with purse nets) they not only

intrude upon the rights of the citizens of the seaboard states, in catching and converting valuable food fishes into guano, but drive the food fish from their natural feeding grounds and prevent the parent fish occupying their natural spawning beds and reproducing their kind.

While it is often denied by those interested in catching menhaden with purse nets that they catch any food fish worth mentioning, I will briefly state one or two of the many items of evidence of the catching and of the wanton waste of food fish by them. In 1892 a bill in the interest of the menhaden fishermen, known as the Laphan Bill, was before Congress, the provisions of which gave them the right to use the purse net all along the coast, in the bays, estuaries, and rivers, limited only beyond the influence of the tide, the law, habits, or customs of any state to the contrary notwithstanding. Strenuous efforts were made to secure this law, which fortunately failed, but, nevertheless, furnishes the plainest evidence of their disposition to override all state laws for the protection of food fish, etc., in their pursuit of the menhaden.

At a hearing on this bill before a Senate Committee the following instances of the waste of food fish were brought out: Mr. S. B. Miller, a fish dealer, in answer to questions asked him, stated that he received at one time 70,000 pounds of food fish, mostly weak fish, from one of Daniel Church's steamers, 10,000 pounds of which went on the market; the balance, 60,000 pounds, went to the guano factory on Barren Island. He also stated that at another time he received from the same source another large lot of food fish from out of which he selected about 10,000 pounds; that the balance of the lot were heated and unfit for sale, and that he told the captain of the boat to haul right out; of course these fish went to the factories; he further stated that with their (meaning the men-

haden fishermen) manner of handling fish, the fish after being covered eight inches with other fish as they are dumped in the hold of their vessels would heat and be unfit for use for food in three hours or less.

Mr. E. G. Blackford, the well-known fish dealer of Fulton Market, before same committee stated that from his own knowledge every year those fishes which feed upon menhaden grow more scarce, that there had been several instances which had been spoken of there of his own knowledge where the menhaden vessels have taken large schools of food fish and have brought them to market; the very large catch of 1891, about a year ago, just about that time of the year, was principally of weak fish. Some four or more vessels came up to Fulton Market with a cargo or quantity of at least 200,000 pounds, nearly all weak fish, and out of that 200,000 pounds about one quarter were marketed; the balance of these cargoes was sent to the factories and rendered into oil and scrap. Mr. Blackford further stated that in his opinion the effect of the great amount of fishing that is carried on for menhaden all along the coast breaks up the schools of fish which are followed by the striped bass and blue-fish, and has a tendency to make these fish seek other feeding grounds.

Mr. George Hildreth of New Jersey, formerly a menhaden fisherman, in answer to the following question, *i. e.*, "Well, on the average would there be a considerable food fish?" replied, "There would sometimes be quite a number of food fish among them (meaning menhaden), and other times very little—whatever there was within the bounds of the net." In connection with the latter part of Mr. Hildreth's answer, that the purse net caught whatever there was within its bounds, I will quote Prof. G. Brown Goode—endorsement (Mis. Doc. 49, Second Session Forty-fifth Congress, page 117). He says, "The purse seine is doubtless more effective than any other fishing appa-

ratus ever devised; by its use a school of almost any size can be secured without the loss of a single fish." The enormous demand of the oil factories can be met only by fisheries conducted upon the grandest scale, and the purse seine is used by the factory fleet to the exclusion of all other nets.

The purse net, as Prof. G. Brown Goode and Mr. Hildreth say, takes all fish within its enclosure or bounds, which must necessarily include the taking of a very large quantity of food fish in its use in taking the average yearly catch of 500,000,000 of menhaden.

Agreeable to statement compiled by Hugh M. Smith, and published in the United States Fish Commission bulletin, the number of hauls made by two menhaden steamers for one season is given as 1078, and the proportion of the catch as one twentieth of the menhaden taken for that time; this would give a total of 21,560 hauls made in a season from the best available data on the subject. The average length of the purse nets used by the menhaden fishermen is about 1360 feet; taking the average length of the nets used as 1350 feet, each haul would enclose 3 32-100 acres, which makes an aggregate of 61,589 acres of water along our coasts, bays, and estuaries upon the feeding and spawning grounds of many of our valuable food fishes thoroughly screened of the food fish yearly. The food fish so taken, hastily dumped by steam power by scoops holding five barrels each, in a mass in the hold of the vessel (precluding the possibility of detecting the various species of fish taken with the menhaden, "even if desired"), where they soon sour and become unfit for food, are taken to the factories and rendered into oil and guano. As before stated, it is claimed by many interested in the menhaden fishery that they take but few, if any, food fish with the purse net, while taking yearly about 500,000,000 menhaden. Those who are familiar with the purse net, and not

interested in the menhaden oil and guano business, have yet to learn how it is possible for the net to take the menhaden without taking the food fish it encloses, especially when the depth of the water does not exceed that of the net used; so that it reaches to the bottom and encloses a certain space of water, forming a flexible wall from the surface to the bottom, then being pursed up along the bottom, I would ask how is it possible for the food fish to escape and the menhaden only be taken? Aside from the waste of the food fish so taken, the indiscriminate use of the purse net in the shallow waters along the coast, in the bays, inlets, and estuaries, the natural feeding and spawning grounds of many of our valuable food fish, drives them to other localities and seriously affects their natural reproduction.

From such statements of the value of the yearly products as I have seen in print, the proportion gives about sixty per cent. in guano and about forty per cent. in oil. Food fish rendered may not add to the product of oil, but do to the product of guano. The subject of coast food fish supply is one that should especially interest the hundreds of thousands of citizens of the seaboard states; that the present waste of food fish from the indiscriminate use of the purse net by the menhaden fishermen, within the three-mile limit, is an abuse of the rights of all citizens. No business is justified in using food fish, which were intended for food for the people, for the purpose of manufacturing into fertilizers; nor is any business justified the prosecution of which, in any way, interferes with the people's supply of food fish. There should be proper restrictions that would be just to all, to the menhaden industry, as well as to millions of hard working citizens who depend upon the continual food fish supply for a livelihood, the many thousands who at times take fish for food for their families, the many thousands who, of choice, prefer to catch their supply of food fish

from the waters adjacent to them, instead of from the market, as well as thousands who resort to the waters along our coasts for food fish as well as for recreation and health; the food fish should be protected within the three-mile limit before it is too late. If the use of the purse net was properly restricted, or prohibited within a reasonable distance from the shores, and used only in waters beyond the depth of the net used, it would go far to stop the present waste and to ensure a continued supply, now so seriously threatened.

I would most respectfully ask the consideration of the members of this Society, and especially those who are commissioners of fisheries of the respective seaboard states, to this important question.

THE PROPAGATION OF SMALL MOUTH BLACK BASS.

BY SEYMOUR BOWER, SUPERINTENDENT MICHIGAN FISH
COMMISSION.

At Cascade Springs, Kent County, near the banks of the Thornapple River, is located an experimental black bass station of the Michigan Fish Commission. The present is the third and most successful season of its operation. The water supply to the experimental ponds is derived from spring sources, not far removed, and is, therefore, too cold for bass work as it reaches the ponds, but the supply is so limited in volume that the area of pond exposure is sufficient to nearly equalize the temperature with that of the Thornapple River.

The Thornapple is well stocked with small mouth bass. Their spawning beds are found all along in front, and for a considerable distance above and below our experimental ponds, thus affording an excellent opportunity, in connection with the pond work, of observing their natural spawning habits and the results.

This station was not established with any idea of permanency, nor with the expectation of hatching any considerable number of bass—the water supply is too limited for that—but rather to acquire practical knowledge by experience, experiment, and observation, so that when funds are available for a large plant they may be expended wisely and efficiently.

Having no special fund for even experimental purposes, the work has necessarily been limited to a small scale of operations. In the summer of 1893 two ponds were excavated. The upper pond was to be used for experimenting in the direction of artificial propagation; the lower, and much the larger, pond was to be devoted to pond culture. During the fall a stock of about 150 adult bass was collected from the Thornapple and placed in these ponds. The fish carried well the following and subsequent winters, and also in the summer, although the temperature in the lower pond rises to ninety degrees at times. No losses of any consequence have occurred, except as a result of handling during the spawning season.

In the larger pond the fish have not been disturbed during the breeding season. In the month of May, 1894, ten beds were made in this pond, from which 32,000 fry were taken as they rose in schools. This does not represent the number hatched, but the number saved, as a part of some of the schools had dispersed before it was discovered that they had risen.

The following spring, or one year ago, this pond was unproductive. Owing to extreme dry weather the supplying springs nearly failed at times, and the water in this pond became stagnant and quite foul and roily. When it cleared up a few beds were observed, and it is quite probable that a few fish spawned notwithstanding the unfavorable conditions, but if they did the beds were undoubtedly cleaned out by a large snapping-turtle that was discovered in the ponds at the time. There is no doubt that turtles have a special fondness for the eggs and fry, as by actual observation two beds in the river are known to have been despoiled in this way.

The present season the shoal margin around the upper end of this pond is literally "peppered" with beds, and the outlook is most promising. There are

sixty adult fish in the pond and eighteen beds are in sight. Five of these beds are non-productive, but the other thirteen will yield about 70,000 fry, 60,000 having already been collected from eleven of the thirteen beds.

The fish in the upper pond were reserved for experiments in the line of artificial propagation. Beginning with the first spawning season, 1894, they were not disturbed until they had commenced to prepare the beds; they were then seined up from time to time and examined. Early in the season one ripe female was found and a portion of her eggs were taken, but there were no ripe males in the pond, so a male was opened, the spermaries removed and pressed out in water which was poured over the eggs. Number of eggs taken 2100; number hatched 700, or thirty-three per cent.

A number of the females were quite soft when first handled, but hardened up with further handling and failed to spawn at all. Bedding was also discontinued, and interference with the natural spawning was resented to that extent that they made no further effort to spawn in a natural way. Not a fish was hatched in the pond and only 700 by artificial propagation. So this experiment was a failure.

A few days later a pair of bass were seined from their bed in the river as they were at the point of spawning, but no eggs or milt could be obtained. They were held in a tank seven days, then removed to a small pond with gravel bottom, but they made no effort to spawn, and finally fungused and died. Another pair was captured in the river while in the act of spawning, a few eggs having been cast; the eggs came freely, but as no milt could be pressed out, only 500 were taken. By opening the male a very little milt was procured, and about 200 fish were hatched from the lot.

The next spring, or one year ago, a small side

pond about nine feet by twelve was excavated and connected by a short raceway with the pond in which the failure of the preceding year had occurred. This side pond carried only eighteen inches of water, a favorite depth selected by the fish in the river for spawning; and being much shoaler it would also grow much warmer, and, therefore, more attractive for the spawners than its larger and deeper consort. The bottom was covered with gravel and small cobble stones, and everything done to make the little annex as inviting as possible. No one but the attendants was allowed to approach the pond during the spawning season. A "blind" was provided near by, from behind which all the proceedings, from the initial step of preparing the beds, to the final rising of the young fish, could be observed without intrusion.

The result more than justified expectations. There were no indications of bedding in the deeper pond, but in two instances, at least, the males literally fought over the possession of the bed in the little annex. Eight beds were made—there was n't room for any more. Three pairs were lifted from the beds, of which one was spawning at the time, but as usual no milt could be pressed out, or only a minute "speck" or fraction of a drop.

No further effort to handle the spawners was made. As the last three pairs handled had not been touched or disturbed in any way, or at any time, until they were at the point or in the very act of spawning, we concluded that while occasionally, under peculiar or accidental conditions, a few eggs might be taken and fertilized, all efforts to reduce the business to a successful working basis would prove useless and futile; further experiments might be interesting, but would result in no practical benefit.

There is probably an appreciable space of time during which the spawn may be taken and fertilized,

but this time is not known, and it would not be practical any way to isolate each pair, as it would be necessary to do, and provide the constant surveillance necessary to insure seizing the opportunity. Moreover, it would be unwise to take the eggs artificially even if it were entirely practical to do so, as we could never hope to equal the natural hatching percentage. Given protection against turtles and water snakes—the male bass will take care of all other intruders—and the natural hatching percentage will often be as high as ninety. Artificial manipulation of adhesive eggs has never reached that figure, and probably never will.

Although to some extent a repetition of the above, I quote from my report in writing to the Board, filed shortly after the close of last season's bass work: "Previous experiments and a careful observation of the conduct of the parent fish prior to and during the act of spawning, lead to the conclusion that the artificial taking and impregnation of bass eggs is possible only when undertaken at exactly the right moment, or within the limits of a period so brief as to admit of success only on rare occasions. A preliminary coaxing and caressing by the male seems imperative, not only to bring the female to the point of spawning, but also to develop the milt. These preliminary proceedings are sometimes carried on for several hours, and again for only a few moments; if interrupted or handled at this time, or prior to the orgasmic stage, neither the eggs nor milt will flow; so that artificial impregnation may be accomplished only during the few moments of actual spawning, or after the natural spawning has begun. Under the strictest surveillance the opportunity is too seldom presented or known for practical operations in this direction. In any event, however, we would lose instead of gain by the artificial handling of bass eggs, owing to the relatively high percentage of natural results in protected ponds and

the relatively low percentage of results by artificial treatment of adhesive eggs."

To refer back to the annex pond: After concluding to allow the natural spawning to proceed without interruption, the fish continued bedding, and when the fry were nearly at the point of rising, the fish that remained to guard the beds were driven out and the pond screened against the parent fish and to prevent the escape of the young. After rising and scattering they were scapped up as wanted for shipment. Total results of this pond for the season, 16,000 fry, all taken from five beds, as three beds were unproductive.

This year there are eight beds in the annex and one in the connecting raceway. Six of these beds are now black with fry, and will yield 20,000 to 30,000. There are thirty adult bass in the pond. The water is a little colder in this pond than in the lower one, hence the fry are a little later in rising.

The perfect success of the little side pond, both last year and this, indicates the style or system of ponds best adapted to the culture of small mouth bass. The storage pond should be quite large and of good depth—say four to eight or ten feet deep. Plenty of boulders should be provided, for shade during the summer and to hover around, as the bass is wont to do while in the torpid condition of its winter retirement. This pond should have no gravelly shoals or margin to encourage bedding, but should be nearly surrounded with small shoal ponds, each connected with the main pond by a short raceway, and made as inviting as possible for spawning purposes. No fear need be entertained that the fish will not seek the side ponds at the proper time. It is demonstrated that, with a suitable water supply, the question of propagating small mouth bass on a scale to provide for large and effective distributions, is reduced to the simple proposition of providing the ponds and breeders.

A few scattering notes in connection with the subject of bass propagation may be of interest, and, therefore, are submitted.

In the Thornapple River the beds are made along the shores in from one to three feet of water, and where the current is very moderate—never in rapid water. A circular ridge of sand and gravel is thrown up and the bottom of the hollow thus formed—always of gravel and pebbles or small cobble stones—is swept bright and clean. This work is almost invariably done by the male, though in a few instances the female was present—which is not usual—and was seen to render some assistance; but this occurs only when the female is under great stress of haste to spawn. In such cases the preparation of the beds had been delayed too long; or they may have been driven from their own beds, duly prepared, by a pair whose bed had likewise been usurped.

Mr. Dwight Lydell, who is in charge of the bass work during the spawning season, and a careful and intelligent observer, was recently an eye witness to an incident of this nature. While watching a pair of bass going through the preliminary manœuvring that precedes the actual spawning, another pair approached the bed with the evident intention of appropriating it. The males at once began a fight that grew quite furious at times, and lasted about an hour. The females took no part, but rushed about in great apparent distress. The rightful owner of the bed, although much the smaller, proved the victor, for the would-be usurpers finally dropped down stream about ten feet and immediately commenced to whip out a bed of their own. They worked rapidly and in forty minutes the bed was ready. Then, after a few moments of sexual sparring, the spawning was begun and completed in five or six minutes. Meantime, the other pair resumed business and in forty-five minutes had completed preliminaries and finished spawning.

The preparation of beds is usually begun in the latter part of April or early in May, though the spawning does not follow, as a rule, until several days later. This year the males began working on the beds in the annex pond on April 30; the first spawning there was on May 8. At the beginning of the season the males work on the beds only occasionally, and suspend work entirely during a cold storm or a spell of cold weather; but as the season advances matters are hastened and preliminaries shortened.

When the bed is ready and the male has induced a female to accompany him to it, there follows a series of movements quite impossible to describe. Generally the female is coy and diffident at first, and inclined to leave, but after much manœuvring and persuasion by the male, is rounded up and reluctantly remains. The male grows more active and ardent; his movements indicate strong sexual excitement and a desire to induce excitement in the female; coaxing and caressing alternate with bunting and biting various parts of the body, but chiefly around the vent. Then the male glides slowly over the bed with a peculiar, trembling, fluttering movement, while careened over nearly on his side. Soon the pair crosses the bed slowly, duplicating the spasmodic flutterings, each leaning over outward, thus bringing their vents close together, although the female is always slightly in advance. The bed is crossed in like manner at intervals of ten to twenty seconds until the spawn is all cast, which usually takes from five to ten minutes. The preliminaries that lead up to the spawning last much longer, as a rule, than the act of spawning, and sometimes fail altogether. In one instance a male was seen, after an hour's ineffectual effort to induce spawning, to drive the female back to the main pond and return in a short time with another. While the female is spawning the entire body is strongly mottled, but resumes its normal

appearance soon after spawning and leaving the bed.

In a paper presented before this Society at its seventeenth annual meeting, Mr. C. S. Holt stated that the male and female bass prepared the bed jointly, and that the female guards the young; but he has since acknowledged to me that later observations have convinced him that he was in error. It is positively known that, except under circumstances heretofore noted, the male bass assumes both of these duties. A number of fish have been captured while performing either function, and the identity of the sex established by removing the spermaries.

In size and color the eggs of the small mouth bass correspond very closely with those of the fresh water herring, being, perhaps, the least trifle smaller in size and a little deeper in color. They will approximate 80,000 to the quart.

The number of eggs per female will range from 2,000 to 10,000 or more. It is quite rare that so few as a thousand fry rise from a bed, and as many as 8,000 have been taken from a single bed in the river, but 3,000 to 6,000 is the usual number.

The length of the hatching period, so far as observations have been made, varies from seventy hours, at an average temperature of sixty-six degrees, to one hundred hours. A merely casual inspection will fail to detect the hatching point, as the fish at first is all sac, which is of the same size as the egg and looks just like it; but on closer examination it will be noticed that the sphere is slightly elongated and a very faint, shadowy line will be seen to extend about one third the way around the sac. But the development is very rapid, and in from six to fourteen days, according to temperature conditions, "the sac that is all sac" has become a black, vigorous, young fish. The black blanket of fry that now covers the bottom of the bed is ready to rise, and they begin to swim up and form a

school, which usually holds together two to four days but may break up in two or three hours if the temperature is very high. On the other hand, the schools have been seen to settle back on the beds and remain a few days longer when there is a sudden and marked change to colder weather. They also usually settle back on the bed at night for the first two or three nights.

In the river the schools do not at first disperse in all directions; they head up stream, some barely holding even with the current, some dropping back, and others forging ahead and making some headway; thus gradually stringing along out in thinly scattered lines.

In addition to the small mouth bass fry furnished by the Cascade ponds, 20,000 were collected from beds in the Thornapple during the season of 1894, 73,000 in the season of 1895, and 62,000 so far this season. We also collected and distributed last season 145,000 fry of big mouth bass, all taken from beds around the margin of Laraway's Lake, near Cascade. So far this season 12,000 have been taken from the same lake. The beds of the big mouth bass are found on and among the roots of pond lilies and various water plants and grasses.

Referring again to the pond feature of the present season's work, it should be noted that a total of ninety adult male and female bass in two ponds have so far produced 60,000 fry for shipment, with 30,000 to 40,000 more in sight.

FISH AND GAME PROTECTION IN NEW JERSEY.

BY H. P. FROTHINGHAM.

I have been asked to present to you my views on the progress made in the protection of fish and game in the state of New Jersey, and I shall do so in as brief and still as comprehensive a manner as possible. It would be useless for me to say anything to you, gentlemen, on the necessity of such protection, and, consequently, I shall at once proceed to give you my views as to why fish and game are not better protected in New Jersey, and I feel confident that a great deal of what I shall say pertaining to New Jersey will apply to a considerable extent also to other states.

The average citizen generally pictures to himself as the worst enemy of fish and game the man who goes skulking through the forest looking after traps, or, armed with a gun having a calibre of a ten-pound cannon destroys everything that presents itself in fur or feathers. Then we also hear of the man who sneaks to the river shore at night with huge nets, and with one sweep captures enough fish to supply the fish markets of New York for a week. Again the picture is presented to us of the farmer who jealously guards his property against all trespassers, in order that his revenue may be increased by unsportsmanlike methods of taking fish and game. From still another quarter comes a cry that if fish wardens were more vigilant

violators of the law would be fewer in number. To offset this there arises a cry that wardens are unmerciful and frequently enforce the laws to the letter, where common sense would dictate the exercise of clemency.

Now, I have no doubt whatever that if we could do away with all these objectionable features there would be more fish and game, and more happiness generally; but in my opinion we must look further for the causes which tend at the present day towards the decrease of fish and game, and among the first and greatest of these causes I should class injudicious legislation. In the halls of our Legislatures protection to fish and game is not always the impulse which actuates the law-makers in passing laws pertaining to the protection of fish and game. Too frequently laws are introduced and passed for the purpose of attaining some private end, or for the purpose of gratifying some particular friend of one of the legislators, and although these laws as applied in the particular cases which gave rise to their enactment may be harmless, they too frequently do mischief in localities for which they were not intended. Then again, there is at times a disposition on the part of the law-makers to go too far, to provide penalties out of all proportion to the character of the offense sought to be punished. What is to be thought of a law, for instance, which provides that corporations which disturb the habits of fish shall be imprisoned for two years, and which gives every Justice of the Peace in the state the right to impose this penalty? Under this law a Justice of the Peace in Squedunkville was empowered to send to state prison the Erie Railroad Company, the Standard Oil Company, or any other corporation, officers, directors, stockholders, agents, and all for having interfered with the spawning of a sucker. Still this law existed on the statute books of New Jersey during the present

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generation, and the commissioners and wardens were, by virtue of their oaths of office, supposed to enforce it. I might call attention to other laws equally ridiculous which you will find on the statute books of some of the states, but I trust that there is no need of my citing any others for the purpose of explaining my meaning. A law in order to be properly enforced must be respected; it must be free from those absurdities which frequently serve as a justification on the part of the general public for a continued violation of a great many of our laws. The public is very quick to perceive the motive of a law, and if this motive does not command respect you cannot hope that the law will do so. If a law is passed for the benefit of a certain individual, or a class of individuals, or if its enactment is dictated by politics, it at once becomes inoperative to a certain degree, and, what is worse, the odium attaching to one law is apt to taint all others. Friends of proper fish and game legislation may camp out in the corridors of our state capitols, within easy gunshot of the Senate, the House of Assembly, and the Executive Chamber, but in spite of all their watchfulness some obnoxious features are almost sure to creep into laws pertaining to fish and game. Eternal vigilance may be the price of liberty, but you cannot obtain consistent fish and game laws at the same bargain.

The next evil concerning which I desire to say a few words is the direct result of the foregoing. Inconsistent legislation conveys the idea to the mind of the casual observer that fish and game laws are passed for the benefit of a very few, and to the injury of the masses. Thus, in New Jersey a great deal of fault is found with the laws governing the taking of fish by the use of nets in the inland tide waters. These laws are more numerous even than the bodies of water to which they apply, for some of the creeks have different laws every few miles, and what is lawful on the north

shore of a bay may be criminal on the south shore. This inequality of regulation gives rise to numerous complaints, and I cannot say that the majority of these complaints are not well founded. The commission at the last session of the Legislature attempted to secure the passage of a uniform law concerning tide water; our wardens had ascertained the desires of the people living along the sea coast, and it was presumed that the proposed measure would meet with little opposition. We felt confident that the vast majority of those directly interested approved of the law as suggested by the commission, but it was this large majority that remained at home, confident that their interests would be taken care of; on the other hand, each individual who wanted some privilege not enjoyed by his neighbors, under the old laws, and each man who thought he knew all about salt water fish and their habits, because, perhaps, he might have smoked herring or made fish barrels for a year or two, hurried to Trenton, and altogether there was such a din of opposition that the legislators buried the measure in committee. The result is that particular localities and certain individuals enjoy privileges not common to all, and the impression continues that our fish and game laws are not made for the benefit of everybody, but that they confer special rights on a favored few. Our laws pertaining to shad prohibit the taking of this fish on Sundays, and the law is a very wholesome one, as it permits the shad to ascend to their spawning ground unmolested for one day in the week. This law is objected to by some, because Delaware, our neighboring state, has no such restrictive legislation. Jersey men complain that they are not accorded the rights enjoyed by their competitors in Delaware. They seem unmindful of the fact that the circumstances in New Jersey are wholly different from those in Delaware, that the shad water over which the latter has control

is small compared to the Delaware River, and that laws which apply to the bay would not be suited as well to the river. Still there is here an apparent inconsistency, sufficient to afford an opportunity to the carping critic. Unfortunately, the faults in the fish and game laws are ever being paraded before the public. What is true of the law protecting food fish is also true, in a measure, of the laws protecting fish whose principal use is to afford sport for the angler, and what is true of fish is also true of game. Thus, in New Jersey, on account of its geographical position, there is a continual contention between the gunners of the northern and of the southern part. The former want an early open season, and the latter prefer to do their shooting later, and both are right, for there is a difference of two or three weeks in the seasons between the two sections. No matter how the law is framed it will be partial to one or the other. It is consequently not at all a matter of surprise that people should argue that fish and game laws are made for certain localities and individuals, and not until people alter their opinions and are taught to believe that fish and game laws are passed for the benefit of all, that they are not intended to be restrictive of the liberty of any person or class of persons, but that their sole object is the preservation of animals for the enjoyment of all who love nature and sport, will our fish and game laws receive that support to which they are justly entitled.

Another evil working against the proper enforcement of the law, and one bearing a close relationship to the foregoing, is the method of conducting politics at the present time. Too frequently are laws dictated by political influence, and too frequently are appointments interfered with in the same manner. Men who are appointed to office, and who are desirous of doing all in their power for the protection of fish and game, are hampered by the power of politics, and this is fre-

quently too great to be ignored. Concessions to those in high political authority are necessary at times, and men entrusted with the enforcement of the laws are required at times to wander from what they recognize as the strict path of duty, for the purpose of placating a power which, if offended, might wipe out the entire machinery of fish and game protection. This may not be a pleasing statement to make, but I am willing to leave it to any one who has had experience in the enforcement of laws whether he has not at times felt the influence of the political boss, and whether such influence was not prejudicial to the cause of sport.

In connection with legislation and the enforcement of the laws, I desire to say a few words concerning the attitude of the newspaper press of the state, and I say, with perfect frankness, that the newspapers have been with us on general principles, and opposed to us in nearly every particular. This may seem strange, but it is easy of explanation. The average human being desires to see the perpetuation of useful animals of all kinds, and, consequently, favors such restrictive or prohibitive legislation as may be necessary to attain that end. It is on this account that the press supports laws and measures advocated by the commission, and we have no better friends than editors and reporters. But let a violator of the law be brought to book and another tale unfolds itself. The idea of protecting fish and game is all right, but the man who is called upon to pay twenty dollars for having killed a rabbit or a song bird is certain to have the sympathy of a great many people, and this sympathy is almost always reflected in the columns of newspapers. The general principle is lost sight of in the extending of sympathy; the warden's side of the story is not sought for, but everything that may extenuate the circumstances of the offense is dwelt upon, and in nine cases out of ten it is made to appear that the prosecution was unjust

and uncalled for. The editors of newspapers and a great many other people seem to be in the position of the character in the play who was in favor of the law, but against its enforcement.

In relation to the men who violate the letter of the law I shall have very little to say. The wardens appointed by the commission have been doing some very good missionary work; their general terms are twenty dollars a lesson, although the price charged varies with the conditions of the occasion. I have known cases where wardens, out of sympathy for some poverty-stricken offender, contributed towards the payment of the fine and costs; and I have known cases where unusually stupid pupils were "kept in" for ninety days. Perhaps two little stories just recurring to my mind may give you some idea as to the character of violators of the law in New Jersey. A warden had made a complaint against a man for having taken three trout under the legal size; the accused promptly admitted his guilt and inquired of the Justice how much his experience would cost him. "Sixty dollars and the costs of prosecution," was the reply. "That is rather a high price to pay for three little trout," replied the offender, as he reached down into his pocket for his wallet. "I should say so," chimed in one of those individuals who are so frequently found in courts of justice; "I tell you these fish and game laws are nothing but outrages on the public; they are made for some brownstone front dudes with silver thingum-majigs to go fishing, and they are nothing but robbery as far as the poor man is concerned." The defendant stopped for just one instant in the exploration of his pocket, apparently astonished at the interference, and then produced the necessary funds and liquidated his indebtedness to the state. Then turning to his would-be-defender, he said: "I think, my friend, you are mistaken. The fish and game laws are all right, and

I should have known better. Even if there were no law against the taking of small trout I ought to have known better, for I am old enough and have fished enough to know that if all the little fellows are taken out there will never be any big ones. The game laws are made for the poor more than for the rich, for the rich can go to Canada or the Adirondacks and get all the fishing and hunting they want. But the poor have to stay at home, and these men," pointing to the warden, "are trying to preserve some fishing for the poor man. It serves me just right, and I know you are wrong. Come, warden, have a drink with me." In another case a warden was called upon by a well-known guide from Greenwood Lake, who said to him: "Mr. Warden, I wish that you would prosecute me. I have been keeping a set-line in the water, and I don't want you to arrest me." "Had you not better wait until I secure the evidence?" inquired the warden. "Oh, no," was the reply; "I have done wrong and I am willing to pay for it; besides that, you will get the evidence fast enough, and then I'll have the bother of going through this when, perhaps, I have less time than I have now. Besides that, I don't want to have those fellows up there say that I have been arrested, and so I want to square up now." The warden did not exactly like the turn affairs had taken, but the guide insisted, and so the warden accepted the amount of the fine and costs. On the following morning he appeared before the Justice of the Peace and as warden complained that a certain guide had violated the law; as attorney for the accused he entered a plea of guilty and paid the penalty stipulated by law.

I have said, gentlemen, that our wardens have done some missionary work, and I think you will agree with me as to the quality of this work when you see that it made a defender of the laws out of a man who was paying sixty dollars, and that it touched the conscience

of a Greenwood Lake guide. The violators of the law, gentlemen, are with us; now, if we can convince the people that fish and game laws are passed for the benefit of all, and that the faults of these laws are not due to their principle, if we can induce the politicians to keep their hands off, and if we can persuade the press to give us a consistent support, the cause of protection for fish and game will be materially advanced. A campaign of education among the masses will be more fruitful of good results than the application of the rigors of the law to the offenders.

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